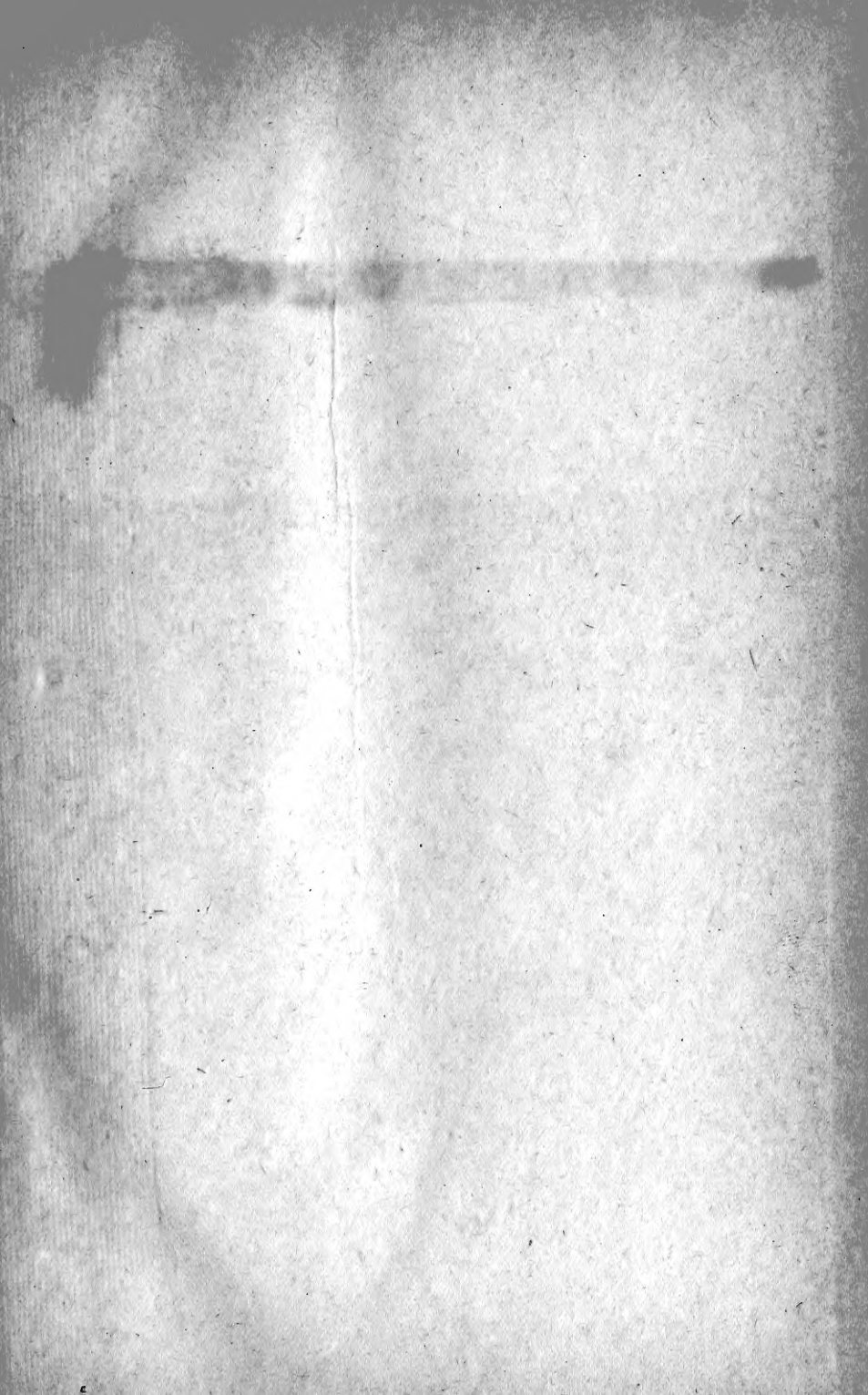


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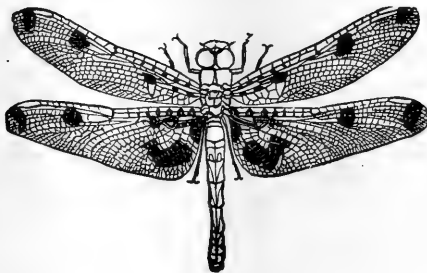


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No. 1

TWELVE YEARS' EXPERIENCE WITH RUBBER STOPPERS. USED IN THE BIOLOGICAL COLLECTION OF THE MUSEUM IN CAMBRIDGE.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The late Professor L. Agassiz, in 1867, requested of me a detailed plan for the development of the entomological department of the Museum. Among the different collections proposed was a biological collection similar to my own for Neuroptera and Pseudo-neuroptera, but extended to include all Arthropoda. The Professor in a marginal note stated that this collection should be commenced immediately, and developed as rapidly as possible. In my collection the alcoholic objects were included in vials placed horizontally near the pinned dry objects, so that all belonging to one species were together and presented a clear view to the observer. I used vials closed with cork stoppers, which for a small collection and by a continual supervision, proved sufficiently safe. Nevertheless experiments were made with several substances, hoping to prevent the evaporation of the alcohol and the necessity of refilling a large number of vials every six months. This arrangement is, as stated, sufficient for a small collection, but when applied upon a comprehensive and extended scale, proves inadequate. The continual supervision and refilling of several thousand vials would have needed a considerably larger expense and a special assistant. The best velvety cork stoppers did not do as well here as in Europe, owing to the greater changes of temperature. Experiments were made during six years upon a large number of substances in the hope of increasing the efficiency of the cork stoppers. Fats, tallow, stearine to impregnate the cork, wax, sealing wax, different resins and varnish, shell-lac, iron-lac, guttapercha and India rubber in different solutions, thick oil paint, collodium, waterglass, very fine bladder around that part of the cork placed in the vial, and glue and paste to cover the external part of the cork with strong paper and bladder, were subjected to trial. Several of these substances were tried on an extensive scale and

for several years, all proving to be more or less unsatisfactory. Finally it was decided to use India rubber stoppers. Though these were decidedly more expensive, they have during twelve years given the most satisfactory results. A continual supervision and re-filling of carefully closed vials is unnecessary, and the greater outlay at first is after a few years more than repaid; time, alcohol and manual help are saved. At first the strong compression of the alcohol in placing the stoppers was the principal cause of insecurity of the filled vials, as the stoppers were very apt to slip out. In putting the stopper in the vial, I introduce now a fine insect pin (to be removed later), allowing the air to escape and thus preventing the strong compression of the alcohol (Ann. Rep. of the Museum for 1874, p. 13).

A small test vial, 70 m. m. long and 16 m. m. broad, filled in this way, October, 1873, was kept purposely for three years in the sunshine; the length of the air bubble retained in the vial was carefully measured, and found to be 14 m. m.; a year later the bubble had about the same length. In summer the bubble was smaller, owing to the greater expansion of the alcohol, proving at the same time the close fitting of the stopper. On November 14, 1882, the bubble was 20 m. m. long, and is now, October 6, 1885, 30 m. m. long. The vial was never opened during the twelve years, and is now in such a condition that it would not need re-filling if used in the collection. The collection contains many smaller vials and a number of larger ones (the largest for the larva of *Dynastes hercules*, 180 m. m. long and 50 m. m. broad), and with very rare exceptions, re-filling was not necessary. I would remark that all stoppers used are of vulcanized India rubber. The so-called pure rubber stoppers used for chemical purposes are probably better, but they were then not for sale in Boston, and are also 30 per cent. more expensive. During late years a number of them have been used to ascertain their reputed superiority. A disadvantage of the vulcanized stoppers is the formation of small crystals of sulphur in the alcohol, which attach themselves firmly to the insects, and are for delicate objects injurious. This disadvantage is, however, easily obviated, or at least very much diminished, when the stoppers are thoroughly washed before use, or better, are put half an hour in warm water.

The most important point was, how long these stoppers would do well, and when they would need to be replaced by new ones. To know exactly the average time of the efficiency of the rubber stoppers, it was necessary to know the number of vials in use. My assistant has counted them carefully. To Coleoptera belong 1,423; Lepidoptera, 1,547;

Pseudo-neuroptera, 979; Neuroptera, 454; Hymenoptera, 523; Galls, 171; Spiders, 644; Parasites, 208; Hemiptera, 57; Orthoptera, 14 (the last two orders are not arranged, and the rich biological material of the alcoholic collection of the Museum is not placed in vials); besides a large number not yet arranged in the boxes of the different orders. There are about 7,800 vials in use. The larger part of the collection presented by Mr. F. G. Schanpp, and the very large collection of the Peabody Academy, are not included in the above enumeration. For want of space, they have been stored provisionally in large glass jars filled with alcohol, in which the small vials with cork stoppers are placed.

Of the 7,800 vials with rubber stoppers, perhaps two-thirds were filled and labelled 10 and 12 years ago, the others in the successive years, half of them three years ago. More than half are of a size needing stoppers of 8 to 12 m. m. at the smaller end; two-thirds of the rest of 14 to 18 m. m.; the rest with larger ones 30 to 37 m. m. (milk stoppers), and a few as large as 42 m. m. Some vials, at times a large number, were opened for identification and study of the contents. A very small number had to be changed every year, and these were closed with pieces of rubber rope (of 6, 10, 12, 16, 25 m. m. diameter), which was used as an experiment, but proved to be unsuccessful. In addition to these, in each year during late years three or four of a certain size needed to be changed. These vials, 65 m. m. long by 8 m. m. broad, were closed by stoppers, which had to be forced 16 m. m. into the vials. The alcohol began to evaporate, the vials turned easily on the corks, which is never the case in well closing vials; the part of the stopper in the vial was somewhat smeared, and had lost its elasticity. Indeed these stoppers would have served probably longer by re-filling, but for greater safety they have been always changed. All these vials were closed twelve years ago, and they began to give out during the last few years. The part of the stopper outside of the vial always bulged out considerably, so that by this mark alone the vials to be changed were easily noticed. A part of these stoppers were not well made; when cut they are not solid throughout, but filled with numerous holes, representing a kind of fibrous tissue. The strong depression in the rubber trade during late years has caused the use of poorer material in vulcanizing; some numbers of the smaller sizes are now decidedly bad. Nevertheless, of all stoppers in use, less than one per mille gives out every year after twelve years' use, and in the first six years probably only one per two mille. Stoppers of the larger size keep

much better. After all, I think the result is a decided success. All the so-called pure rubber stoppers for chemical laboratories of American make are, as far as I am able to ascertain, manufactured of vulcanized rubber, which is not the case with those imported from Germany. The Professor of the chemical laboratory here has had the same experience. The 7,800 stoppers of different sizes have cost about \$110; if they had been bought at once at wholesale figures, the price would have been 30 to 35 per cent. less.

As the stock in hand for the advancement of the collection has to be a large one, I may draw attention to a method recommended by Prof. W. Hempel, of Dresden, Saxony, to prevent the stoppers becoming too hard (*Bericht d. Deutsch. Chem. Gesell.*, 1882, vol. xv., Heft. 6, No. 184). Rubber stoppers or tubes retaining their elasticity should be kept in large glass jars, in which an open vessel with petroleum has been placed. It is better to keep the light from the jar; wooden boxes should not be used. Stoppers which have become hard should be brought together in a jar with sulphuret of carbon until they are softened, and afterwards be kept in a jar with petroleum just as the others. Before knowing this I used to soften such stoppers by squeezing in different directions, or by rolling with a piece of board. Of course Prof. Hempel's method is better, as it prevents the gradual evaporation of the fluids used for the solution of the rubber in the process of vulcanization. It is remarkable that until now none of the stoppers in the vials arranged in wooden boxes have become hardened, though the same stoppers not fixed in vials with alcohol grew hard. Probably the strong pressure of the alcohol by fitting the stoppers has some influence in keeping them soft; besides, the part of the stopper outside of the vial is mostly small. I do not know whether rubber stoppers for similar purposes have been used here or in Europe earlier than in the Cambridge Museum; if so, I would be very glad to know the results obtained elsewhere.

PRELIMINARY LIST OF THE SPECIES OF ACARINA OF NORTH AMERICA.

BY HERBERT OSBORN, OF THE IOWA AGRICULTURAL COLLEGE, AND
LUCIEN M. UNDERWOOD, OF SYRACUSE UNIVERSITY.

The Acarina, especially the more minute forms, have been but little studied in America, a fact which seems the more strange when we con-

sider what interesting objects they form for microscopic work. As in most groups of Arthropoda, the pioneer work in this country was done by Thomas Say, whose descriptions of a number of the larger species appeared as early as 1821. Later on Dana and Whelpley (1836), and Haldeman (1842), contributed descriptions of a few species. More recently Dr's. Fitch, Leidy, Packard, Riley, LeBaron and Shimer, and Mr. Ashmead, have published descriptions of species and notes on habits, while quite lately Mr. Harry Garman has published a valuable paper on the Phytoptidæ, which it is hoped he will follow up by still more extensive study of this family.

It is hoped that the following list of the Acarina of the United States and Canada—which we have made as complete as possible up to date—may encourage the further study of the group, and as an additional aid it may be in place to make a few statements concerning their habits and the methods of studying them.

The Trombididæ are found on plants or free as adults, frequently in the larval form, as parasites on insects. The Hydrachnidæ are aquatic, and probably many interesting parasitic forms will be found by careful examination of the gills of bivalve mollusks. Of the Gamasidæ occurring as parasites on insects but few of the probable number have yet been described. In the Acaridæ we have many parasitic forms on birds and mammals, and here especial care should be taken to identify with described European forms whenever possible, particularly in all cases where the bird or mammal host is identical in the two countries. Doubtless many described species occur commonly here which have never been recorded, e. g. *Myobia musculi* seems never to have been recorded in America, but has been taken at Ames, Iowa, and hence is included in our list. A few species common to domesticated animals that are being constantly imported from other countries have been included in this list, even when we have been unable to find a positive record of their occurrence here.

The Phytoptidæ are microscopic in size, and occur on buds, leaves and fruits, producing galls, deformations, blisters or rusts, and their study offers an almost unlimited field for careful investigation.

A large proportion of the mites are too small to be readily studied or preserved, except as microscopic objects, and the most desirable method is to mount them at once, or as soon after collecting as possible, in glycerine jelly or prepared balsam. It is frequently a great advantage to

examine them carefully with the microscope while still alive and moving.

The American literature on this subject, besides being quite scanty, is widely scattered, and some of the papers now quite difficult to procure.

Family TROMBIDIDÆ Leach.

I. *Tetranychus* Dufour.

- 1—T. TELARIUS Linn. Packard, Guide to Study of Insects, 660; Murray, Economic Entom., 97*; Saunders, Can. Ent. xii, 237* (1880); Insects Inj. to Fruit, 355* (1883); Ontario Entom. Rep., xi, 70* (1880); Forbes, Ill. Rep., xiii., 106 (1884); Standard Nat. Hist. ii., 103.

II. *Trombidium* Fab.

- 1—T. PARASITICUM Murray. Economic Entom., 129* (1877); Ont. Entom. Rep., xi., 71 (1880).
Atoma parasiticum, Latr. (1806). Riley, Mo. Rep., vii., 176* (1875).
Trombidium muscarum, Riley. First Rep. U. S. Entom. Com. 306-311 (1878).
- 2—T. SERICEUM Say. Jour. Phila. Acad. ii., 70 (1821); Coll. Writings ii., 16; Riley, Mo. Rep. vii., 175* (1875), et. Supp., 63; Murray, Economic Entom. 138* (1877); Ont. Entom. Rep. xi., 72 (1880).
- 3—T. GRYLLARIUM Murray. Economic Entom. 136* (1877).
Atoma gryllaria, LeBaron. Ill. Rep. ii., 61* (1871).
- 4—T. SCABRUM Say. Jour. Phila. Acad. ii., 69 (1821); Coll. Writings ii., 16; Riley, Mo. Rep. vii., 175 (1875).
- 5—T. GIGANTEUM Riley. First Rep. U. S. Entom. Com., 312 (1878).
- 6—T. BULBIPES Packard. Mass. Rep. iii., 26* (1873); Murray, Economic Entom. 136*; Ont. Ent. Rep. xi., 71.

LARVAL FORMS INCERTIS SEDÆ.

- 1—LEPTUS (*Trombidium* ?) AMERICANUS Riley, Mo. Rep. vi, 122 (1874); Murray, Economic Entom., 116*.
- 2—LEPTUS (*Trombidium* ?) ARANÆ Say, Jour. Phila. Acad. ii., 80 (1821); Coll. Writings ii., 23.
- 3—LEPTUS (*Trombidium* ?) HISPUS Say, Jour. Phila. Acad. ii., 81 (1821); Coll. Writings ii., 23.
- 4—LEPTUS (*Trombidium* ?) IRRITANS Riley, Mo. Rep. vi., 122 (1874); Murray, Economic Entom., 116*; Ontario Entom. Rep. xi., 71.

* A star indicates an illustration at the reference marked.

- 5—OCYPETE (*Trombidium* ?) COMATA Say, Jour. Phila. Acad. ii., 82 (1821); Coll. Writings, ii., 23.

III. *Erythræus* Latr.

- 1—E. MAMILLATUS Say, Jour. Phila. Acad. ii., 70 (1821); Coll. Writings ii., 16.

Family BDELLIDÆ Duges.

I. *Bdella* Latr.

- 1—B. MARINA Packard, 1st Rep. U. S. Fish Com., 544 (1874); Guide to Study of Insects, 660; Am. Nat. xviii., 827* (1884); Standard Nat. Hist., ii., 103.
2—B. OBLONGA Say, Jour. Phila. Acad. ii., 74 (1821); Coll. Writings, ii., 19.

Family HYDRACHNIDÆ Sundeval.

I. *Limnochares* Latr.

- 1—L. EXTENDENS Say, Jour. Phila. Acad. ii., 80 (1821); Coll. Writings ii., 22.

II. *Hydrachna* Müller.

- 1—H. COCCINNEA Haldeman, Proc. Phila. Acad. i., 196 (1842).
2—H. FORMOSA Dana & Whelpley, Am. Jour. Science, 1st ser., xxx., 357* (1836).
3—H. NEBULOSA Haldeman, Proc. Phila. Acad., i., 196 (1842).
4—H. PYRIFORMIS Dana & Whelpley, Am. Jour. Science, 1st ser., xxx., 358* (1836).
5—H. 5-UNDATA Haldeman, Proc. Phila. Acad., i., 184 (1842).
6—H. SCABRA Haldeman, Proc. Phila. Acad. i., 184 (1842).
7—H. TRIANGULARIS Say, Jour. Phila. Acad. ii., 79 (1821); Coll. Writings ii., 23.
8—H. TRICOLOR Packard, Am. Jour. Science, 3rd ser., i., 108 (1871).
9—H. BELOSTOMÆ Riley, 1st Rep. U. S. Entom. Com., 312* (1878).

III. *Atax* Fab.

- 1—A. HUMEROSA. Standard Nat. Hist. ii., 102. Where described?
2—A. YPSILOPHORUS. Standard Nat. Hist. ii., 102. Where described?

IV. *Thalassarachna* Packard.

- 1—T. VERRILLII Packard. Am. Jour. Science, 3rd ser., i., 107 (1871); Standard Nat. Hist. ii., 102. Referred by Murray to *Pontarachna*.

Family GAMASIDÆ Leach.I. *Sejus* Koch.

- 1—S. AURIS Murray, Economic Entomology, 167 (1877).
Gamasus auris Leidy, Proc. Phila. Acad., 1872, 138.

II. *Dermanyssus* Duges.

- 1—D. AVIUM Duges —. Murray, Economic Entom., 169* ; Ont.
 Entom. Rep. xi., 73.

III. *Gamasus* Latr.

- 1—G. ANTENNÆPES Say, Jour. Phila. Acad. ii., 71 (1821) ; Coll. Writings
 ii., 17.
 2—G. COLEOPTRATORUM Latr. — ; Packard, Guide to Study of Insects,
 663 ; Murray, Economic Entom., 158*.
 3—G. JULOIDES Say, Jour. Phila. Acad. ii., 72 (1821) ; Coll. Writings ii., 18.
 4—G. MUSCULUS Say, Jour. Phila. Acad. ii., 72 (1821) ; Coll. Writings ii., 17.
 5—G. NIDULARIUS Say, Jour. Phila. Acad. ii., 72 (1821) ; Coll. Writings
 ii., 17.
 6—G. SPINIPES Say, Jour. Phila. Acad. ii., 71 (1821) ; Coll. Writings ii., 17.

IV. *Argas* Latr.

- 1—A. AMERICANA Packard, Rep. U. S. Geol. Survey of Montana, Idaho,
 Wyoming and Utah (Hayden) 740* (1872) ; Murray, Economic
 Entom., 182.

V. *Uropoda* Latr.

- 1—U. AMERICANA Riley, Proc. A. A. A. S. xxv., 273-275* (1877) ; Mo.
 Rep. ix., 41 (1877) ; Standard Nat. Hist. ii., 102.
 2—U. VEGETANS DeGeer. — ; Packard, Guide to Study of Insects, 663 ;
 Murray, Economic Entom., 162*.

Family IXODIDÆ.I. *Ixodes* Latr.

- 1—I. ALBIPICTUS Packard, Am. Nat. ii., 559* (1868) ; 1st Ann. Rep.
 Peabody Acad. Science, 65 (1869) ; Am. Nat. iii., 365 (1869) ; Guide
 to Study of Insects, 662* ; Standard Nat. Hist. ii., 100*.
 2—I. AMERICANUS Latr. —. Fitch, N. Y. Rep. xiv., 363 (1871).
 3—I. ANNULATUS Say, Jour. Phila. Acad. ii., 75 (1821) ; Coll. Writings
 ii., 19.

- 4—I. BOVIS Riley, Packard, 1st Ann. Rep. Peabody Acad. Science, 68 (1869); Rep. U. S. Geol. Survey of Montana, Wyoming and Idaho (Hayden) 740* (1872); Guide to Study of Insects, 663, 668*; Murray, Economic Entom., 193; Osborn, Bull. Iowa Agr. Coll., 75 (1884).
- 5—I. CHORDEILIS Packard, 1st Ann. Rep. Peabody Acad. Sci., 67 (1869).
- 6—I. COOKEI Packard, 1st Ann. Rep. Peabody Acad. Sci., 67 (1869).
- 7—I. CRENATUS Say, Jour. Phila. Acad. ii., 76 (1821); Coll. Writings ii., 20.
- 8—I. CRUCIARIUS Fitch, N. Y. Rep. xiv., 366 (1871).
- 9—I. ERRATICUS Say, Jour. Phila. Acad. ii., 77 (1821); Coll. Writings ii., 20.
- 10—I. FUSCUS Say, Jour. Phila. Acad. ii., 79 (1821); Coll. Writings ii., 22.
- 11—I. LEPORIS-PALUSTRIS Packard, 1st Annual Rep. Peabody Acad. Science, 67 (1869).
- 12—I. NIGROLINEATUS Packard, 1st Ann. Rep. Peabody Acad. Science, 66 (1869).
- 13—I. ODONTALGIÆ Fitch, N. Y. Rep. xiv., 371 (1871).
- 14—I. ORBICULATUS Say, Jour. Phila. Acad. ii., 76 (1821); Coll. Writings ii., 21.
- 15—I. PUNCTULATUS Say, Jour. Phila. Acad. ii., 78 (1821); Coll. Writings ii., 21.
- 16—I. 5-STRIATUS Fitch, N. Y. Rep. xiv., 366 (1871).
- 17—I. ROBERTSONII Fitch, N. Y. Rep. xiv., 366 (1871).
- 18—I. SCAPULARIS Say, Jour. Phila. Acad. ii., 78 (1821); Coll. Writings ii., 21.
- 19—I. UNIPUNCTATA Packard, 1st Ann. Rep. Peabody Acad. Science, 66 (1869); Guide to Study of Insects, 662, 668.*
- 20—I. VARIABILIS Say, Jour. Phila. Acad. ii., 77 (1821); Coll. Writings ii. 21.

Family ORIBATIDÆ Nicolet.

I. *Oribata* Latr.

- 1—O. ASPIDIOTI Ashmead, Can. Entom. xi., 93 (1879); Saunders, Insects Inj. to Fruit, 396 (1883).
- 2—O. CONCENTRICA Say, Jour. Phila. Acad. ii., 73 (1821); Coll. Writings ii. 18.
- 3—O. GLABRATA Say, Jour. Phila. Acad. ii., 73 (1821); Coll. Writings ii., 18.
- 4—O. QUADRIPILIS Fitch, N. Y. Rep. iii., 442 (1856).

II. *Nothrus* Koch.

- 1—N. OVIVORUS Packard, Guide to Study of Insects, 664,* Riley, Mo.

Rep. ii., 102 (1870); 3rd Rep. U. S. Entom. Com., 175* (1883); Standard Nat. History, ii., 102*.

III. *Hoplophora* Koch.

- 1—H. ARCTATA Riley, Mo. Rep. vi., 53, 81 (1874); Murray, Economic Entom., 225*; Saunders, Insects Injurious to Fruit, 239* (1883); Ontario Entom. Rep., xiii., 66; Standard Nat. Hist. ii., 102*.

Family. ACARIDÆ.

I. *Tyroglyphus* Latr.

- 1—T. MYCOPHAGUS Megnin. Jour. Anat. Phys. (1874)*; Ontario Entom. Rep. xi., 73*.

Rhizoglyphus mycophagus Murray, Economic Entom., 262*.

- 2—T. PHYLLOXERÆ Riley, Mo. Rep. vi., 52, 53, 81 (1874); Saunders, Can. Ent. xiv., 127* (1882); Insects Inj. to Fruit, 239* (1883); Ontario Entom. Rep. v., 61; xiii., 66; Standard Nat. Hist. ii., 100.

Rhizoglyphus phylloxeræ Murray, Economic Entom., 258*.

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INCERTIS SEDÆ.

- 1—HYPOPUS CONCOLOR Hald., in Terrestrial Air Breathing Mollusks of the U. S. (Binney), ii., 107.
- 2—ACARUS? SEMEN Walsh, Proc. Am. Entom. Soc., iii., 606.
- 3—ACARUS? ÆNIGMA Walsh, Proc. Am. Entom. Soc., iii., 608.

ELAPHIDION PARALLELUM, NEWM., AND PHYMATODES VARIABILIS, FABR.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

In the Oct. number of this journal I noticed with interest the article by Mr. Clarkson on *Elaphidion villosum*, Fabr. I have reason to believe that the same is partly the case also with *E. parallelum*, Newm., which I find to be the common oak-pruner here. But I do not agree that it is always, or even in the majority of instances, the case with either species.

As bearing on this subject I give the following extract from my notes for 1885, which relates also to *Phymatodes variabilis*, Fab. :—

“Last fall (Sept.) I laid in a large supply of red, white and black oak and hickory twigs, containing larvæ of oak-pruners. The majority were red oak and hickory, but all were kept in separate boxes. Also a large box full of sawed hickory wood which contained wood-boring larvæ. These were all kept regularly moistened. During May and June, as I was absent from home at the time, another person, a lady, collected and saved for me a bottle full of beetles from the vicinity of these boxes (all taken from and around the large box of hickory wood, she says). These I afterward examined, and found the bottle to contain 145 *Phymatodes variabilis*, Fab., and 18 *Elaphidion paralleum*, Newm., besides two *Tenebrionidæ* of uncertain origin. As to which the two species proceeded from, the twigs or the hickory wood, the lady, who examined the twigs from time to time without being able to discover a single specimen among them, is almost certain that they all came from the large box of sawed hickory, on the underside of the papers covering which she was able to pick them off in large numbers, as well as all over and around the box and on the wood inside. Upon examining a good number of the twigs of each kind later in the season, I found not an insect in them (with the exception of one which contained a dried and shrivelled larva that had not transformed), but they showed every sign of the insects having emerged as perfect beetles. The *E. paralleum*, Newm., must have come from the twigs, while the *P. variabilis*, Fab., all proceeded from the sawed hickory wood. Packard gives the latter species as living only in white oak, but I am confident that these came from hickory, though I cannot conceive what became of the other numerous *Elaphidions* which must have emerged from the twigs.”

In my notes for 1884, under date of 18th Sept., I extract also the following :—“Found an oak-pruner in the pupa state, inclosed in its silken white cocoon, inside a red oak twig. The end of the twig was not closed up, as is usually the case, but the passage was open, and a couple of inches up from the end the larva had changed to the pupa state, leaving its cast off skin below it in the passage.”

Upon reading the account by Dr. Fitch, of *E. villosum*, Fabr., I find he says that “some of the worms enter their pupal state the last of autumn, and others not till the following spring. Hence, in examining the fallen limbs in the winter, a larva may be found in one, a pupa in an-

other." Now, though I have found the pupa of *E. parallelum*, Newm., very early in the fall (18th Sept., as stated above), and Mr. Clarkson has found the imago of *E. villosum*, Fabr., in November, I am inclined to think that these early metamorphoses were from eggs deposited earlier than others, or that by some favorable circumstances these individuals developed more rapidly and thus metamorphosed earlier. It is my opinion that both these species may assume the imago state either in the fall or the following spring, some, more forward than others, attaining this state in the fall. Perhaps favorable years, when some of the eggs may be deposited earlier in the summer than usual, produce the autumn imagos, which then remain within the twigs during the winter and emerge early in the spring. These in turn, if the season is at all favorable, will lay their eggs earlier than the others, and thus continue the early metamorphosis.

Toward the conclusion of his account Dr. Fitch says that "in at least three-fourths of the fallen limbs no worm is to be found," it having been devoured by birds either at the time the branch fell or afterward. The ground under oak and hickory trees here I have known some years (1884) to be covered with the twigs early in September, blown down by heavy winds, and at such times nearly all of the larvæ are destroyed by insectivorous birds, which extract them from their burrows, if they have not already been dislodged. This explains why so few of the beetles were obtained from the twigs I had saved—only 18 beetles from a large supply of the twigs, every one of which had certainly fallen that season, and been occupied at the time—the birds had destroyed all the others, and that very soon after their fall! But I cannot concur in the view taken by Dr. Fitch, that the larva severs the branch that it may fall to the ground, thus to aid its transformation. It is very probable that the larva cuts the twig to stop the flow of sap, the dead wood being necessary to mature its growth, and is conscious of none of that "consummate skill and seemingly super-terrestrial intelligence" which the worthy Doctor so enthusiastically attributed to it.

MISCELLANEOUS NOTES ON BUTTERFLIES, THEIR LARVÆ, ETC.

BY W. H. EDWARDS, COALBURGH, W. VA.

2. On the scarcity of certain Species in 1885.

The most notable instance was that of *C. Philodice*, which is usually

a very common species here. Throughout the year I saw but three or four examples.

In 1884, *V. Cardui* was remarkably abundant, as it seems to have been all over the Northern States. But in 1885 I scarcely saw one.

The Argynnis *Cybele* and *Aphrodite* were conspicuous for their absence in '85; so also *Phyc. Nycteis* and *Tharos*. For several years *P. Ajax* and *Turnus* have been far less common than formerly, though no change has taken place in the abundance of their food-plants. As to *Arg. Diana*, I have seen but two examples in as many years, and the species is practically extinct here.

2. As to Food Plants of *P. Ajax*.

The only plant known to me is the Pawpaw, Asimina. At the Philadelphia meeting of the A. A. A. S., 1884, Mr. E. M. Aaron stated that *Ajax* larvæ fed on spice-wood and upland huckleberry; and in a letter to me subsequently, that of his own knowledge, he knew *Ajax* would lay eggs on spice-wood, and that the larvæ fed both on that plant and sassafras.

I tried in vain, in 1885, to make these larvæ eat either spice-wood or sassafras, giving both to the young just out of egg, and before their taste could have been prejudiced against these plants by having eaten pawpaw. The larvæ starved to death, and I could not see that a leaf was even nibbled. I then tried larvæ immediately after successive moults to the last, with same result. So that I am satisfied *Ajax* larvæ in this region will not eat the plants spoken of. For Tennessee, where Mr. Aaron's observations were made, I do not undertake to speak. The only butterfly larvæ which will eat spice-wood and sassafras, so far as I know, are those of *P. Troilus* and *P. Palamedes*, and they are restricted to these and allied plants.

3. PAP. PALAMEDES. This species has been taken at Glencoe, Nebraska, as Mr. G. M. Dodge writes me, many degrees farther to the north than has before been observed.

4. CHIONOBAS BORE, Schn. and Hübner.

In the paper on "Insects in Arctic Regions," the translation of which is printed in CAN. ENT., xvii., p. 157, the author, Herr Aurivillius, says: "Let us take as an example *Oeneis Bore*, Schn., a true hyperborean butterfly, which has never been found outside the Arctic circle, and even there only occurs in places which bear a truly arctic stamp." In the note

appended, the editor of C. E. says that Mr. Edwards "informs us that Mr. David Bruce has taken *C. Taygete* Hüb., which is syn. of *Oeneis Bore* Sch., in Colorado." Not being satisfied that Mr. Bruce's examples were *Taygete* Hüb., I sent a male, one of them, to Dr. Staudinger, who replied, 16th Oct., 1885: "The *Chionobas* agrees perfectly with some *Bore* Hüb., from the highest northern region of Europe, the Varanger Fjord. *Bore* is a very variable species, and offers all passages to *Taygete* Hüb., so that I consider the latter as the Labrador form of *Bore*. Now that the true *Bore* is also discovered in Colorado is a very interesting fact; it would be interesting to see a large series of this Colorado form, to know if there also will be passage to the Labrador *Taygete*." I saw six examples of this *Bore*, taken by Mr. Bruce, and they were all of one pattern, so that I do not believe any passage into *Taygete* will be found in Colorado. In the absence of such, I shall regard *Bore* as a species distinct from *Taygete*. It may be one species in Europe, but so far as appears is thoroughly distinct in America.

On the end of abdomen of one of the females sent me by Mr. Bruce was an egg shell adhering to the hairs. By softening the butterfly, I was able to get this off in fair condition, so that Mrs. Peart has found it possible to make an excellent drawing of it. I do not despair of yet obtaining eggs of this species and rearing the larvæ. Mr. Bruce found *Bore* on the highest summits visited by him.

5. CHIONOBAS NORNA, Thunb.

This species has hitherto been supposed to be limited to Europe and Asia. But I have received three females of it from northern Alaska. One I sent to Dr. Staudinger, who writes, 29th Nov., 1885: "As far as I can judge from this one bad specimen, it is a dark variety of *Norna*. This is a very variable species, which I receive also from North and Central Asia, and from whence I have some specimens like to this one sent, although *Norna* is generally lighter colored." The other two females were nearly perfect, and no doubt they are *Norna*. I hope to figure both *Bore* and *Norna* in vol. 3, But. N. A.

6. On feeding Larvæ after Frost has killed the Leaves.

Mr. A. H. Mundt, of Fairbury, Ills., has told in a former number of CAN. ENT. how he fed belated larvæ of *P. Cresphontes* on dried leaves of the prickly ash, which he softened in water, and that his larvæ went to pupation. He writes, 13th Nov., '85: "I have still five larvæ of *Cres-*

phontes. I forgot to get food for them before it froze, but found in a book a lot of leaves of *Ptelea trifoliata* (Hop-tree) gathered two years ago last spring. These I soaked over night, laid between blotting paper, and put in the glass. The larvæ eat them readily." This shows the way to carrying through belated larvæ in the fall, but also how larvæ from far off regions may be saved, if the dried leaves of their plants are sent with them.

7. Larvæ supposed to have been killed by Electricity.

Miss Annie M. Wittfeld wrote me 23rd Sept., 1884, from Georgiana, Fla.: "Yesterday about daybreak, the sky was completely clear. Some twenty minutes later a small black cloud rose in the southeast, and moved very fast, though there was a dead calm with us. All of a sudden came a stroke of lightning and at the same instant a fearful clap of thunder and a puff of wind that took all before it. It lasted but a second and then all was clear and calm again. After breakfast I went to my glass of *Limenitis Eros* larvæ, of which I had six fully grown, and found all to be dead and stiff. All my other larvæ were not affected; these last were in wooden boxes, while the *Eros* were between glass."

8. On pairing Butterflies in Captivity.

It is common enough for certain Sphinges and Bombycidæ to mate in boxes, and immediately after leaving pupae. This may happen when the eggs are mature at birth of insect. With many species of butterflies the eggs do not mature for several days after chrysalis, as is the case with the large Argynnids, but with others, as *Phyciodes Tharos* and *Nycteis* and *Myrina*, they are mature from the start. I have not experimented in this direction, but from what Miss E. L. Morton, of Newburgh, N. Y., tells me, it may be possible to induce butterflies of some species to mate and so to obtain eggs, for the eggs are laid very shortly after copulation, as I have several times observed. Miss Morton had by mistake placed a male *Satyrus Alope* under a bag of netting on grass. Three days later she introduced a female, which up to that time was supposed to be the second female. Almost immediately the pair mated, and a few hours later eggs were laid. In attempting to get eggs in this manner, it would be best that a male caught in the field should be introduced to a female just from chrysalis, for in the field it is these last which are sought by the males. Almost always when a pair of butterflies in copulation are taken

the male will be found worn or broken, while the female is uninjured in wing, and therefore must have lately left the chrysalis.

g. Effect of Cold applied to certain Larvæ.

I was feeding a brood of *Coenonympha Ampelos*, in June, from eggs sent from Vancouver Island, by Mr. Fletcher. After second month all the larvæ showed signs of lethargy except one, which went rapidly to pupa, having passed but three moults. (At same time I was feeding larvæ of *C. Galactinus* from eggs sent by Prof. Rivers, from California, and all these pupated after but three moults. From the pupæ came *Californius*, proving this species to be seasonally dimorphic, *Galactinus* being the winter, *Californius* the summer form.)

The remaining *Ampelos* larva spoken of at last rested asleep. Early in August, I placed them on ice, temp. about 32°, and there left them three months, till 7th Nov., having in mind to delude them into a belief that winter was over and gone when they should be brought into warm air again. The experiment succeeded perfectly as to part of the larvæ. On 21st Nov., one passed 3rd moult, and 2nd Dec. a 4th moult, and 30th Dec. pupated. Another passed 3rd moult 23rd Nov., but has not yet reached the 4th (as I write 5th Jan. '86.) In fact, these larvae feed and move about only when placed in sunshine, and cloudy days and cold nights retard their growth. Two other larvae seem to have gone to sleep again, and have not moulted since they left the ice. It is usual for larvae to pass a moult soon after the end of hibernation, apparently to get rid of the shrunken skin, and this is an extra moult. At least, I have found this so, whenever the larvae hibernate half grown, so that *Ampelos* should pass four moults if hibernated, though three are the rule in summer.

ON TWO NEW HEMIPTERA-HETEROPTERA.

BY WM. H. ASHMEAD, JACKSONVILLE, FLORIDA.

Among a very interesting collection of Mexican and other Hemiptera sent to me by Mr. Samuel Henshaw, Curator of Boston Society of Natural History, for identification, I find two species new to science and peculiar to genera never before detected in North America, although both are well represented in the European fauna.

In the first genus, *Stenocephalus* A. & S., in Europe, four species are known, principally peculiar to the southern portions of that continent.

These are :—*S. agilis*, Scop.; *S. setulosus*, Ferrari; *S. medius*, Mls. Rey, and *S. neglectus*, H. S.

In the other genus, *Cantacader*, A. & S., two species only are known—*C. quadricornis*, and *C. Staudingeri*, Baer., also from south Europe.

Now, the detection of representatives of these genera in North America is especially gratifying to me, and below will be found full generic and specific descriptions.

FAMILY COREIDÆ.

Stenocephalus, A. & S.

Gen. char.—Head triangular, prolonged anteriorly between the antennæ with its extremity bifid; eyes large, globular, prominent; antennæ very long, hairy; first joint thickened, a little shorter than the head; second joint slender, much longer than the first; third shortest; fourth about as long as the second and slightly stouter; beak attaining to the base of the intermediate legs; first and second joints about equal in length; third and fourth shorter; prothorax trapezoidal, narrowed anteriorly, and with the posterior angles not very prominent: scutellum triangular, moderate sized; elytra with corium long and membrane with five or six longitudinal veins, sometimes forked; abdomen not quite as long or sometimes a very little longer than the elytra and rounded posteriorly; legs moderately long, hairy, without spines; femora but slightly curved, subequal in length.

Stenocephalus Mexicanus, n. sp.

Length, .43 inch. Brownish pubescent, form of *Stenocephalus neglectus*, H. S., but more robust, and thickly and finely punctate, punctures black; head blackish; antennæ: first joint stout, black, more densely pubescent than other joints; second joint but slightly longer than fourth, with two yellowish white annuli; third joint shortest, with a yellowish white annulus at base; fourth joint with a small yellowish white annulus at base and another in the middle; beak with first joint yellow; second joint yellow beneath, above and joints third and fourth piceous; the extreme tip of scutellum is yellow. The membrane of wing is brown with six longitudinal veins, the first and last being forked, and the stout vein at base, or where it joins the corium, yellow; legs: anterior femora black, excepting at base, which is yellow, tibiæ for a third of their tips and at base black, balance yellow, tarsi black; intermediate and posterior femora yellow for more than half their length, balance black; tibiæ and tarsi same as anterior pair.

Described from one specimen, Isthmus of Tehuantepec, Mexico, F. Sumichrist.

This is the first of the genus described from North America, and is very closely related to *S. neglectus*, H. S.

It is at once distinguished from that species, however, by a more robust form, a different antennal and abdominal coloration, and by the membrane not quite reaching the tip of the abdomen.

FAMILY TINGITIDÆ.

Cantacader, A. & S.

Gen. char.—Head elongated and projecting but little between the antennæ; front horned; eyes small, globular, not prominent; antennæ slender, very long; the first two joints short, second very long, fourth short, pointed fusiform; beak lying in a well pronounced groove, and reaching nearly to the base of the posterior legs; prothorax somewhat abruptly rounded at its posterior border and not prolonged to a point, although the scutellum is not uncovered. The other characters are those of *Monanthia*.

Cantacader Henshawi, n. sp.

Length, .23 inch. Yellowish brown, elongate, narrowed anteriorly, and gradually widened posteriorly, with the wings extending beyond the abdomen: head brownish on vertex with three pale horns, two just back of antennæ and the third in the centre just back of these, with their points converging forward towards each other, two pale but prominent lateral carina, one on each side, extending from base of antennæ back to prothorax, more prominent posteriorly; eyes brown; antennæ: first and second joints short, stout, brownish, the first twice the length of the second; third joint extremely long, slender, paler in color, and abruptly thickened and black at tip; fourth joint longer than first, fusiform, black; thorax with lateral margins reflexed, and with three prominent carina; wings long with the raised veins piceous and the reticulated cells small; abdomen and legs brownish yellow, with the extreme tips of tibiæ and tarsi and claws black.

Described from one specimen sent me by Mr. Samuel Henshaw, labelled Boston, July 7th, 1879, to whom I take pleasure in dedicating the species.

It is the only species of the genus described from North America, and is a very easily recognized species.

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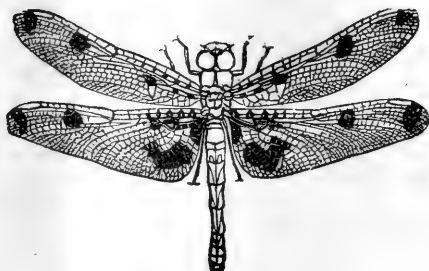
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The Canadian Entomologist.

VOL. XVIII.

LONDON, FEBRUARY, 1886.

No. 2

NOTES OF 1885 ON SOME INJURIOUS AND OTHER COMMON INSECTS.

BY JOHN G. JACK, CHATEAUGUAY, QUEBEC.

Read before the Montreal Branch Ent. Soc. of Ont., 9th Feb., 1886.

The past season was remarkable, in our locality, for the general scarcity of diurnal Lepidoptera, and also of many of the Coleoptera, especially among the Scarabeidæ, Cerambycidæ and Buprestidæ. Many species of these, usually plentiful, seemed rare this year, and even *Lachnosterna fusca* was not nearly so abundant or injurious as it is generally. Perhaps, with the exception of *Colias philodice*, the most common butterfly was *D. archippus*, which I have never seen so common. I do not think I saw a single specimen of *P. cardui*, although it was very abundant last year. *Picris rapæ* was less numerous and appears to be decreasing in numbers every year, largely owing, no doubt, to the attacks of the parasite *Pteromalus puparum*. The birds also, especially the Fly-catchers, do not get full credit for the good work they do. Insects of all other orders seemed to be about as abundant as usual, and several species proved to be more than usually numerous and destructive.

The Buffalo Tree-hopper (*Ceresa bubalus* Say) was again very abundant, doing very much injury to apple and pear trees in young orchards. On July 5th I found some larch trees (*Larix Americana*) with the foliage very much destroyed by Saw-fly larvæ, and on examining the trees in the woods and surrounding country, I found that they were all attacked. At this time most of the larvæ seemed to be a little more than half grown, and they continued to feed until about July 15th, when some of them made cocoons. Many of the trees were now entirely defoliated, and the branches and twigs literally covered with the larvæ, many of which were dropping to the ground, and with the falling "frass" made a sound like that of fast falling rain drops. Three days later (July 18) very few of the larvæ were to be found, most of them having formed cocoons among the old

leaves and debris, or in the loose surface soil at the base of the trees or in the vicinity. When collecting some of these cocoons on July 19th, I found that very large numbers had already been collected and the larvæ taken out by some small animals, probably mice and moles, as there was a perfect network of small burrows under the old leaves and grass. The empty cocoons were collected into little heaps, and a very large handful could often be gathered at a single grasp.

Having been kept in a moderately warm room, some of the imagines emerged from the cocoons on December 22nd, and continued to do so almost daily until January 17th of this year. The larvæ, cocoons and imagines agreed exactly with the figures of *Nematus Erichsonii* (Hortig), in Prof. Riley's report to the U. S. Department of Agriculture for 1883.

I had noticed these larvæ on the larch trees in former years, but they were not so generally abundant, and I had not the opportunity to study them.

My father has told me that about thirty years ago the tamarack woods were entirely defoliated, and looked as though scorched by fire, and he thinks that the saw-fly larvæ were probably the cause. It was more noticeable at that time, as there were large tracts of land covered with tamarack forest that have now entirely disappeared.

Another insect has proved to be peculiarly injurious this season to young growing beans. It is a small dipterous fly, and specimens sent to Prof. Riley were determined by him as *Anthomyia angustifrons*, Mirgen (= *A. colopteni*, Riley), the larvæ of which have been hitherto known to feed upon the eggs of *Caloptenus*. During the past summer the larvæ attacked a field of golden wax beans that were planted about June 15th, and on that part of the field that was most seriously injured, at least nine-tenths of the crop was destroyed. About ten days after planting, as very few of the beans had grown to the surface of the ground, an examination was made for the cause, and it was found that nearly every bean was infected by from 1 or 2 to 20 or 25 small, long, white maggots. Some of the beans attacked had hardly sprouted, while most of them had grown from one to two inches, but being planted deeply, they had scarcely reached the surface. Both the stems and seed-leaves were attacked. These larvæ were first noticed on June 25th; by the 28th many of them had pupated, and hardly a maggot could be found after July 2nd. The flies emerged

about July 10th. If this bean-feeding habit of the insect should become general, it might prove very annoying.

Grasshoppers of several species were very abundant and injurious, hundreds of bushels of grain having been destroyed by them, while pasture and grasses were much injured, and many young fruit trees were defoliated. Some farmers reported in early September that their buckwheat had been so devoured by grasshoppers that only the stumps of the stalks remained.

Cicada canicularis Harr. was not so common this season as it has been some years.

Females of the fall canker-worm moth (*Anisopteryx pometaria*) were taken depositing eggs on apple trees, Nov. 21-24. This insect is not common in our part of the country, and is not noticeably injurious.

Larvae of the pear-tree slug (*Selandria cerasi*) were found as late as Oct. 30th, or later. They are not abundant and give us no trouble.

The fall web-worm, *Hyphantria textor*, has become more abundant and troublesome during the past three or four years. Young larvae were first noticed July 10th, and new lots continued to hatch until about the middle of August.

A fresh specimen of the cotton moth (*Aletia xyliana* Say) was taken Sept. 19th.

On July 12th, a large number of small parasitic flies emerged from a dead cut-worm (Noctuidae). These parasites are evidently the *Copidosoma truncatellum* Dalman, which is so well figured by Prof. Riley in his Report to the U. S. Dept. of Agr. for 1883.

Early in December I took a living specimen of *Cyrtophorus verrucosus* Oliv. in the wood of wild red cherry (*P. pennsylvanica* Linn.), and also found a large number of larvæ which I think were of the same species, as they occupied similar cavities to that of the beetle. The larvae of a Lepidopterous insect (probably *Ægeria*) was found under the bark of the same tree.

On Dec. 8th, a living pupa of *Tremex columba* was taken from the heart of a green beech log, the log being over ten inches in diameter. At the same time larvae of *Saperda calcarata* were taken from the heart of *Populus tremuloides*.

NOTES ON STAPHYLINIDÆ.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

The following are some notes on a dozen of the more interesting species of *Staphylinidæ* which I have found in this vicinity. Two of the species, which will be duly given, were determined by M. Fauvel. All the others were identified by Dr. Horn.

Falagria dissecta Er. Numbers of this almost minute species were taken 8 Oct., 1884, in, on and under decaying and rain-soaked fragments of a large, reddish-tinged fungus growth, which I had previously plucked and broken to pieces to obtain *Phenolia grossa* Fab.

Homalota festinans Er. This species was determined by M. Fauvel, to whom I sent specimens, together with one other species given farther on. Ten or twelve specimens were taken by me on an old board fence one still and sunny day in autumn, 9th Nov., 1884. They were flying in the air, often alighting on the weather-beaten boards; and being quite small and dark-colored, one would occasionally be detected only by the lustre of its wings in the sunlight. In the evening of the following day I took a specimen, which I think is the same species, running over my papers as I was writing by lamp-light.

Quedius vernix Lec. This fine species is entirely of a highly burnished jet black. I took two specimens 9th Nov., 1884, under the soft, completely rotted remains of an old log in the woods. Both specimens lay perfectly motionless when they were disturbed, looking as though they were dead, but I recognized them, although they were black amongst black.

Philonthus brunneus Grav. I do not remember the conditions under which the original specimens were found; but they were probably taken in decaying fungus. One specimen, which I am quite sure belongs to this species, I took 8th Oct., 1884, in the same pieces of decaying fungus with *Falagria dissecta* Er.

Philonthus microphthalums Horn. This is a rather small species, and was also taken 8th Oct., 1884, with *Falagria*. Several specimens were found in the decaying pieces of fungus.

Philonthus baltimorensis Gray. This very pretty species, with polished black head and thorax and reddish clytra and abdomen, is oc-

asionally taken flying in summer and autumn, as are so many of the *Staphylinidae*.

Philonthus apicalis Say. This is a very fine species, of a shining black with the tip of the abdomen dark reddish. Two specimens alighted on my clothes in the woods 19th Oct., 1884; and while endeavoring to capture one, it emitted on my fingers a clear liquid having a strong smell which I cannot describe better than by saying that it was like a mixture of wintergreen and fungus essence. The odor lasted for some time, but in some unaccountable manner the Staphylinid disappeared. An hour or so afterward, in another part of the woods, a second specimen alighted on me, and this time I was more successful and captured it. It emitted the very same scent, and in this specimen it seemed to me that the scent was in the form of an essence or oil all over the body; as I could not find that the insect emitted it visibly, yet my fingers would be touched with it wherever I touched the insect. It was probably emitted as a clear liquid at first from the extremity of the abdomen, and afterward got over the body.

Xantholinus cephalus Say. This specimen I have elsewhere given as taken in one instance under the bark of a dead trunk of basswood in Oct.

Cryptobium bicolor Grav. One taken on my clothes 2nd Oct., and another under a stone 8th Oct., 1884.

Pacderus littorarius Grav. This species I have taken in colonies in passages under the bark of dead stumps in Feb., and under dry rotten wood in Oct.

Boletobius exoletus Er. This is the other species kindly determined for me by M. Fauvel. It does not seem to be given in our lists. M. Fauvel writes me: "Le No. 2 est *Bolitobius exoletus* Er. (*trinotatus* Horn nec Er.)" It is given in Fowler and Matthews' Cat. of Brit. Coleopt. (as is also *trinotatus* Er.), and is consequently found in England. I took one specimen of this very pretty species 26th Aug., 1885, in a decaying "toad-stool" fungus.

Olophrum obtectum Er. The nomenclature of the U. S. species of this genus was formerly very mixed, but is straightened out satisfactorily now; *marginatum* Makl. is now a synonym of *marginatum* Kirby, and *convexicollis* Lec. of *rotundicollis* Sahlb., while *rotundicollis* Say and *emarginatum* Say are synonyms of *obtectum* Er., the name now adopted for the species under consideration. Two specimens were taken 8th Oct., 1884, in the decaying pieces of fungus with *Falagria*.

I might mention that all the above genera are found in Europe; all

except the last two (and very probably they also occur) are given by Sharp from the Amazon region in South America (Sharp, Staphylinidæ of the Amazon, Trans. London Ent. Soc., 1876, Parts I. and II., May and June), while *Philonthus* and *Xantholinus* are found also in New Zealand.

NATURAL HISTORY NOTES ON CERTAIN COLEOPTERA.

No. I.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Ceophyllus monilis Lec. Several of these curious little coleopters were taken May 11th, from a colony of ants inhabiting under a flat stone. This ant is honey yellow, .18 inch in length, very sluggish in its movements, and not disposed to be vicious; it seems to be the same as that with which *Batrisus bistriatus* is found (also in May), and is perhaps *Lasius integerrimus*, Mayr., which Mr. E. A. Schwarz thinks is the name of the ant with which on several occasions he found the same beetle in Michigan in early spring.

The beetles were on the under side of the stone distributed among the ants, and taking alarm immediately on its being overturned, scampered off so quickly into the underground galleries that only a few could be captured.

Dr. Leconte founded the genus on a single specimen taken in Michigan, in August, under the bark of the American linden; his specimen was only .11 inch in length, while these measure .16; otherwise his description applies, or from the different habitat another species might be inferred. Does *C. monilis* desert the ants in the spring to breed beneath bark during the summer and its offspring resort to the habitations of these ants to spend the winter? It is on many lists, but, except in the instance mentioned, has any one taken it elsewhere than with these insects? There are a considerable number of beetles found in friendly association with ants, especially in the spring, many of which are not recorded as having been observed elsewhere; but where their larval lives are spent is something entirely unknown. Some of them, in the spring, leave their friends, like *Cremastochilus canaliculatus*, which may be observed from May till August alighting during the hottest sunshine on warm stones and dusty roads; but whether all likewise leave is uncertain. The suggestion

is made to those finding ants-nest-beetles to mount an ant with each, as it will add much to the interest and value of the collection.

Eleusis pallidus Lec., seems to be rare. The specimens from which Dr. Leconte described the species were found in ants' nests; but their occurrence there was probably accidental, as their exceedingly thin, depressed form indicates a subcortical rather than a subterranean habitus. This summer I took a colony of over twenty under the decomposing bark of a Balm of Gilead (*Populus candicans*), a near ally of the western cotton tree, under the bark of which another species, *E. fasciatus*, is found abundantly.

Cercus pennatus Murr., may be taken plentifully about the second week in May, on the blossoms of the Red Elder (*Sambucus pubens*), and is seldom seen after it is out of bloom. It is mostly found on bushes growing in or near marshy places, those on dry situations yielding but few examples; and from this it may be properly inferred that the larvæ require a humid soil for their habitation. In the synoptic table in Dr. Horn's revision, the club of the antennæ is said to be bi-articulate; this, however, does not appear to be a very constant character, as the difference in size between the ninth and tenth joint is in many specimens scarcely appreciable, especially in the males.

Cucujus clavipes Fab. The very depressed form of this well known beetle indicates, *a priori*, its subcortical habit, and no other has power to adapt its tastes to a greater variety of timber—locust, maple, oak, hickory, gum, buckeye, &c., are all alike to it. The larvæ do not eat the wood nor the bark, living apparently on the moisture existing between the two. They are elongate, much depressed, brownish yellow, and scarcely to be distinguished from those of *Dendroides canadensis*. Some time in September, the larva having matured, constructs a circular cell from small particles of the decaying bark and wood, and in this completes its transformations before severe frost, but the beetle does not quit the cell till the following spring. I have never known any of these insects to be taken elsewhere than under bark, though they undoubtedly fly, being possessed of a good pair of wings. On the 10th of October, 15 newly disclosed individuals and several pupæ were taken under the bark of a gum log; the latter are depressed like the beetle, pale at first, the eyes, antennæ and portions of the legs gradually changing to black, and the elytra becoming red after disclosure. This insect is annual.

Elater militaris Harr. is as rare as the preceding is common, though

it may eventually be discovered to be much more plentiful than heretofore, since collectors have been furnished with the data for its recognition by the publication of Dr. Leconte's Synopsis of the genus (Trans. Am. Ent. Soc., vol. 12). Till now it has been among a set of unfortunate beetles, with names in the catalogues and descriptions accessible to few. It may readily be confounded with *E. linteus*, with which it is found, specimens of which occur with the apical black of the elytra more or less obsolete; but it may always be distinguished by the epipleura being entirely black, whereas in *lintheus* the anterior half is conspicuously pale. The elytra are yellower than in *lintheus*, with the external and sutural margins narrowly black and a little cloudiness at the apex in one of my two specimens. The antennae, besides having the second and third joints rounded and equal, scarcely exceed in length the thorax in the male, while in the female they are one third shorter. Nine specimens that I have seen have the foregoing characteristics.

Elasmocerus terminatus Say, was obtained in large numbers from a box of dead grape vines in May and June. These grape vines also yielded a multitude of *Phymatodes amoenus*, some *Neoclytus erythrocephalus*, *Chariessa pilosa*, *Tenebrioides corticalis*, besides other smaller species. The *P. amoenus*, which had nearly pulverized the vines, had mostly emerged before *E. terminatus* appeared. On splitting the vine several of its pupae were found in galleries excavated by the larvae themselves; these were from four to six inches in length; the distal end was packed with coarse fibre after the manner of the Cerambycans, and the other, towards which lay the head, with fine dust, leaving about an inch of vacancy for the pupa. These, like the perfect insects, vary from .25 to .50 inch in length. They are cylindrical, the abdomen smooth without projections or hooks, and having a greater diameter than the parts anterior; color entirely pale, the emargination of the eyes and tip of the abdomen first become dark, then the legs and wing pads; next the pupa skin is cast, and in three or four days the head and thorax have also changed to dark and the abdomen to red, and then the perfect insect comes forth in quest of flowers and a mate, the time occupied in the transformation having been from ten to fourteen days.

The vines contained the larvæ of several species, but which produced this beetle was not certainly ascertained, though I strongly suspect it to have been one that was round, six-footed, .25 to .50 inch. in length, white with a very small retractile black head armed with short, strong mandi-

bles; the legs stout, with one claw; the pro-legs well developed; the segments gradually tapering from the seventh to the head, the others not varying much in diameter, except the last, which is tapering and terminated with two short black hooks; the body has a few long stiff hairs. These larvæ were taken in the act of excavating galleries similar to the ones in which the pupæ of *E. terminatus* were found.

Whether the larvæ are carnivorous is unknown, but they are certainly lignivorous, as the work of their burrows shows. The Cleridæ are said to be parasitic in the larva state, but this species looks like an exception, as that much misapplied term is scarcely elastic enough to embrace a larva that is at the most only carnivorous.

Xanthonia villosula Mels. Two forms at least are recognized in this species. The first is the typical, entirely brownish rufous, and usually taken on oak, especially white oak, in June and July; it is so abundant and well known as to require no further notice. The other is slightly larger, with the thorax a little less convex and more coarsely punctured; the under sides except the legs are black; the antennae, mouth parts and feet are always yellowish; the head, thorax and elytra vary from ferruginous through all degrees of cloudiness to deep black. Like the other form, in life they are densely coated with an amorphous white powder that gives them the appearance of having been dusted with flour, and is so fugitive as to be only imperfectly preserved by the most careful handling possible. This form appears to feed on hazel alone, though it may be taken on any bush in its vicinity. While perhaps not separable from the first form by any constant structural characters, yet for the benefit of collectors it might be well that it should as a color variety have a name.

When color variations are in any way constant, they are as necessary in a complete cabinet as typical forms, and might be named and catalogued with great advantage to collectors and no detriment to science.

Nemognatha nemorensis Hentz. This beetle has a wide range, extending from the Atlantic to Colorado. It is probably not so rare as it seems to be, owing perhaps to the character of its food plant and its apparent resemblance to certain common and undesirable species of Lampyridæ, both of which may cause it to be readily overlooked. I find it abundantly throughout July on two species of *Rudbeckia* growing in meadows bordered with woods (*R. speciosa* and *R. hirta*), which rarely yield any Coleoptera except *Acmaeodera pulchella*. The insects belonging to this genus and the next (*Gnathium*) are remarkable for having the

outer lobe of the maxillae greatly elongated, being in some species equal to the length of the body, and very slender. As seen in the cabinet these lobes are widely separated, but in life they are closely approximated, forming a single nematoid appendage. In the present species this arrangement is admirably adapted to the character of the flowers on which they feed; the florets of the *Rudbeckias* being very long and very compactly inserted on the disk, to reach the nectaries at their bases, just such an armature is required. The lobes of the maxillae are inserted closed and do not embrace the florets nor open and shut in feeding, but are moved up and down like a drill, the needle shifting around among the florets without being withdrawn; but in what way the nourishment is conveyed to the mouth I could not ascertain.

The species of this genus are numerous west of the Mississippi, and it would be interesting to learn what species of flowers they frequent.

NOTE ON ORYSSUS SAYI.

BY W. HAGUE HARRINGTON, OTTAWA.

The members of the genus *Oryssus* are apparently rare in Canada, and I was therefore much pleased to capture on the 2nd June a fine ♀ *O. Sayi*. It was running up and down a telegraph pole (one of the new ones put up for the electric light wires), and had at first glance all the appearance of some small wasp (*Crabronidæ*), searching for a suitable hole for its nest. Its movements were very quick, and its antennæ vibrated rapidly. It was so alert and restless that my prospects of capturing it without a net seemed far from bright. However, the capture was made, and its struggles in my cyanide bottle were brief. A few days later I took a ♂ upon one of the same poles, although in a different part of the city, and saw what appeared to be another of these insects fly away from higher up the pole. On the 24th I secured another female, which was even more active than the first, and which flew away and returned to the same place twice before I effected its capture. This habit of flying away when disturbed and of returning, even from some distance, to the very spot left, is one which I have noticed in other species of *Uroceridæ*. The poles upon which the above specimens were taken are cedar, and it is more than probable that the insects had emerged from the poles, as many had very numerous holes in them, apparently of *Uroceridæ* as well as of *Coleoptera*.

ADDITIONS TO THE LIST OF CANADIAN LEPIDOPTERA.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

But little attention seems to have been given to Micro-Lepidoptera by Canadian collectors hitherto, so far as can be gathered from the printed lists, 83 names being all that could be reached when the latest one was published. It is certainly not for want of an abundance of material to work upon. I turned my attention to them specially last summer, and was quite surprised to find that so many different species could be obtained when sought for, considering that the season was a most unfavorable one for collecting generally, and no doubt affected them similarly. Mr. Fernald has kindly named the following 33 species for me, which I had in duplicate :

- | | |
|--|---|
| 1. <i>Scoparia libella</i> , Grote. | 18. <i>Ctenectra xanthoides</i> , Walk. |
| 2. <i>Botis terrealis</i> , Fr. | 19. <i>Amphisa discopunctana</i> , Clem. |
| 3. " <i>venalis</i> , Gr. | 20. <i>Conchylis straminoides</i> , Gr. |
| 4. <i>Cataclysta fulcalis</i> , Clem. | 21. <i>Eccopsis permundana</i> , Clem. |
| sp. 5. <i>Paraponyx plenilinealis</i> , Gr. | 22. " <i>concinna</i> , Clem. |
| 6. <i>Homophysa albolineata</i> , G.-R. | 23. " <i>inornatana</i> , Clem. |
| 7. <i>Ephestia interpunctella</i> , Hub. | 24. " <i>Footiana</i> , Fern. |
| 8. <i>Crambus sericinellus</i> , Zell. | 25. <i>Penthina hebesana</i> , Walk. |
| 9. " <i>alboclavellus</i> , Schl., | 26. <i>Sericoris agilana</i> , Clem. |
| var. | 27. <i>Paedisca transmissana</i> , Walk. |
| 10. " <i>topiarius</i> , Zell. | 28. " <i>Scudderiana</i> , Clem. |
| 11. " <i>elegans</i> , Clem. | 29. <i>Semasia formosana</i> , Clem. |
| 12. " <i>vulgivagellus</i> , Clem. | 30. <i>Steganoptycha nubeculana</i> , |
| 13. <i>Schoenobius longirostrellus</i> , Cl. | Fern. MSS. |
| 14. <i>Cryptolechia tentoriferella</i> , Cl. | 31. <i>Phoxopteris nubeculana</i> , Clem. |
| 15. <i>Epigraphia eruditella</i> , Gr. | 32. <i>Chimabacche haustellata</i> , |
| 16. <i>Pandennis lamprosana</i> , Robs. | Wlsm. |
| 17. <i>Lophoderus politana</i> , Haw. | 33. <i>Gelechia roseosuffusella</i> , Clem. |

There were several which I sent to him besides, that were new to him or unnamed in his collection. Of these 33, four are in the Canadian list Nos. 3, 4, 12 and 21. No. 4 is in the Society's collection as *C. annulalis* Walk., which Mr. Fernald informs me is a South American species, and 21 is probably the *Grapholitha permundana* of the Society's list. The conditions must be particularly favorable for the development of No. 4 at

Ridgeway, I would suppose from the multitudes of them I saw there last summer. I found them amongst some walnut trees which were growing by the lake shore, on the line where the barren sand of the beach joined the vegetation of the field, and when the lower branches or grass was disturbed, they would rise in clouds. I have now in my collection 108 named species; of these 58 have printed labels, leaving 25 labels yet unoccupied by me, and giving me 50 names new to the Canadian list, and I have 76 single specimens besides yet undetermined.

TENTHREDO (?) DELTA, PROV.

BY W. HAGUE HARRINGTON, OTTAWA.

Among the Tenthredinidæ captured by me during the past season was a good series of *Tenthredo delta* Prov, consisting of 12 females and 26 males. In pinning them I was frequently struck by the evident irregularity of the venation of the wings, and on a more careful examination of the specimens I find these irregularities to be both numerous and remarkable. No other species represented in my cabinet show any such divergencies from the typical form, except in rare instances. Provancher describes the female (page 210, "Petite Faune Entomologique du Canada") as having *two* discoidal cells in under wings, and Cresson ("Trans. Am. Ent. Soc.," vol. viii., page 44) as having *one or two* middle cells. *One* middle cell appears to be the rule, and any deviation therefrom to be an exception. Of my 12 specimens, 10 have *one* middle cell each, one has *two* middle cells, and the other *none*. The males are more uniform apparently in their venation, as none of my 26 specimens have middle cells in the under wings, thus agreeing with the description given by Cresson (loc. cit). Apart from the varying number of middle cells, the under wing of the females have the cells varying much in shape, especially the middle one, which ranges from a small triangular form to a large four-sided (square or irregular) one. There are also occasionally small additional cells on the posterior margin.

The most interesting variations are, however, to be observed in the anterior wings, and in this respect both sexes are nearly on a par; a female with *three* marginal cells is offset by a ♂ with but *one*. The former has both wings symmetrical as regards the additional marginal cell, and in

having the outer submarginal partly divided, while in the second the right wing shows a portion of the cross-nervure, which is totally wanting in the left. A rudimentary, or incomplete, cross-nervure in the outer submarginal cell occurs in several specimens, and in one ♂ the third submarginal nervure is continued half-way across the cell below. Another male has the third submarginal cell divided into two cells by a cross-nervure, which nearly coincides with the second recurrent. The left wing of one specimen has the third submarginal nervure forked at the anterior end, so as to form a minute triangular areolet, which, on the opposite wing, is almost square, and gives from the lower outer corner a branch partly across the cell. The outer submarginal cell is also in one instance partly divided longitudinally by a branch from the centre of the third submarginal nervure. The consideration of variations such as these specimens afford will indicate one of the difficulties which may attend the determination of a species (especially in the case of single insects) from descriptions, and the possibility of its being placed in a wrong genus and confounded with some species resembling it in color and markings. In a species whose wing-venation is evidently so unstable as that of the present insect, the specimens with additional complete or rudimentary cells appear to be reversions toward an earlier type, in which the wing-cells were more numerous. Another point in regard to the wings of this species is that the outer cells of the under wings of the male (in all my specimens) are closed, as in several of our species of *Strongylogaster*. This fact is not mentioned in the descriptions before quoted, and seems to me sufficient reason to question the propriety of placing the species in *Tenthredo*, from the members of which genus it also differs in general appearance, and to suggest the advisability of including it for the present in *Strongylogaster*. From the first tribe of this genus (as divided by Cresson) it seems to differ chiefly in having the lanceolate cell with a short, straight cross-line, instead of an oblique one. That its true position in the family is somewhat uncertain is evident from the fact that it was originally described as a species of *Pachyprotasis*, a genus much further removed from *Tenthredo* than is *Strongylogaster*. My specimens were all taken in the same locality—a swampy meadow margin, luxuriant in ferns, herbaceous plants and shrubs. The majority of them were taken during June and July.

THE ENTOMOLOGY OF VANCOUVER ISLAND.

NOTES ON SEVENTY-SIX SPECIES OF CICINDELIDÆ AND CARABIDÆ
COLLECTED NEAR VICTORIA, VANCOUVER ISLAND.

BY GEORGE W. TAYLOR, VICTORIA, B. C.

The beetles enumerated below were all taken by myself in the neighbourhood of Victoria, Vancouver Island, during the past few seasons. Some of the larger species, especially the Colosomas, were captured under heaps of rubbish in my garden. The species of Omus and Cychrus and many others were found while searching for land shells under oak logs in the woods. Very many kinds too were found under stones, also during search for shells, while most of the rarer kinds were taken, accidentally I might say, while flying in the sunshine.

The number of specimens of Carabidae that could be collected here is very large, individuals being in fact far more numerous than I have ever seen them anywhere else, and I feel confident that a season's careful working would almost double my present list of species.

A large number (40 out of 78) of those I now record are new to the Canadian fauna, that is, as far as my knowledge of the same (which is based upon the Toronto Check List) goes, and some of these additions are very interesting ones.

The correctness of the determinations is, I think, beyond question, all the types (except in the case of eleven species) having passed through the hands of Mr. Ulke, of New York, who has been most kind and obliging in this matter. The remaining eleven species have been named for me by Dr. Horn, through the kind mediation of Mr. W. H. Harrington, of Ottawa. I have added to the list two species taken on the mainland of British Columbia by Mr. James Fletcher (of Ottawa) in 1883, and very generously given to me.

CICINDELIDÆ.

1. *Cicindela vulgaris* Say, var. Not uncommon, but much less frequent than the next species.
2. *Cicindela 12-guttata* Dej. The variety *Oregona* Lec. is the form occurring here. It is very common indeed, especially by the sea-side. I have another species of *Cicindela* not yet identified.

CARABIDÆ.

3. *Elaphrus Clairvillei* Kirby. One specimen only, on 20th August, 1882, near the margin of Green Mountain Swamp (Victoria). I have searched the locality on several other occasions, but have failed so far to procure another specimen.
4. *Elaphrus riparius* Linn. This widely distributed species is very abundant here.
5. *Loricera 10-punctata* Esch. Several specimens on different occasions, generally flying in the middle of the day.
6. *Notiophilus sylvaticus* Esch. Not common.
7. " *nitens* Lec. Two only. A third species of *Notiophilus* is at present undetermined.
8. *Nebria virescens* Chaud. Several at different times.
9. " *Mannerheimii* Fisch. A pair under seaweed on the beach.
10. *Leistus ferruginosus* Mann. Not rare.
11. *Calosoma tepidum* Lec. Not uncommon ; very variable in size.
12. " *calidum* Fab. Several specimens of this fine beetle last spring. I have also three or four *Calosomas* which seem different from my type of *calidum*, but I have not yet submitted them to any authority.
13. *Carabus taedatus* Fischer. Common under logs, etc. A few days ago I secured 20 or 30 in some holes that had been dug the day before for fencing posts.
14. *Cychrus marginatus* Dej. Quite the commonest of our large Carabidae.
15. *Cychrus angusticollis* Fischer. Not so common as *marginatus*, but by no means rare.
16. *Omus Dejeani* Reiche. Very common under logs, and often to be seen wandering over the roads, I suppose in search of prey.
17. *Omus Audouini* Reiche. Not uncommon.
18. *Promecognathus crassus* Lec. I took a couple under a stone in 1882, and this season I have seen two or three more.
19. *Dyschirius patruelis* Lec. One specimen only. I have this year taken a considerable number of a species a little larger than this, but in other respects very similar. They were found running over the sands at Cadboro' Bay.
20. *Dromius piceus* Dej., var. *quadricollis* Lec. Several.
21. *Blechrus lucidus* Lec. Very common under logs and stones.

50. *Chlaenius interruptus* Horn. Not very uncommon in damp localities.
 51. " *harpalinus* Esch. " " " "
 52. *Anisodactylus viridescens* Lec. Not rare ; color variable.
 53. " *semipunctatus* Lec. Common.
 54. " *piceus* Meretr. Common.
 55. " *Californicus* Dej. Common.
 56. *Bradycellus nigrinus* Dej. Not rare.
 57. " *Californicus* Lec. Not rare.
 58. *Harpalus cautus* Dej. Very common.
 59. " *rufimanus* Lec. Very common, less so than the other two.
 60. " *somnolentus* Dej. Very common.
 61. *Stenolophus conjunctus* Say. Common.
 62. " *limbalis*, Lec. Common.
 63. " sp. "Not named yet"—Ulke. Common.
 64. *Patrobis fossifrons* Dej. Not uncommon under logs.
 65. *Bembidium mutatum* Gemm. 71. *Bembidium nigripes* Kirby.
 66. " sp. A. 72. " *connivens* Lec.
 67. " sp. B. 73. " *versicolor* Lec.
 68. " *erasum* Lec. 74. " *sulcatum* Lec.
 69. " *incrematum* Lec. 75. " *conspersum* Chd.
 70. " *iridescens* Lec. 76. " *paludosum* Sturm.
 var. *lacustre*.

All these species of *Bembidium* seem to be common except *paludosum*, of which species I have only taken one specimen, and I cannot recall the precise locality. Of the two unnamed species, Mr. Ulke informed me that he had specimens from other localities, but they were not yet described.

The species determined for me by Dr. Horn are as follows : Nos. 1, 6, 9, 12, 23, 73, 74, 75, 76 ; and the two under-mentioned species, which are the ones alluded to at the commencement of this paper as having been taken on the mainland of B. C. by Mr. Fletcher.

Cicindela imperfecta Lec.

Opisthius Richardsoni Kirby.

NOTE ON AN INJURIOUS SAW-FLY LARVA.

BY THE REV. THOS. W. FYLES, SOUTH QUEBEC.

Length of larva, one and one-eighth inches ; breadth at widest part, three-sixteenths of an inch. The body flattened beneath, and slightly rounded above. It is scalloped along the sides. The legs proper are long and projecting. The creature has the habit of twisting the last four or five segments to one side. When disturbed it throws itself into the usual attitude of a *Nematus* larva. Its general color is yellow—the head has an orange tinge. There are ten rows of black spots on the body—six rows along the back, one row on each side, and two rows underneath. The spots of the side rows are longer than the rest, and are placed one on the fore part of each scallop. In each of the rows on the back the spots run three to a segment. The last segment has no spots. The eyes of the larva are black, and the mandibles are brown. The creature forms a rather loose, white cocoon.

Swarms of this kind of larva fed on the white birch, in the neighborhood of Quebec, during the month of September. They have all now gone into the cocoon stage.

NOTES ON TENTHREDINIDÆ, 1885.

BY W. HAGUE HARRINGTON, OTTAWA.

Read at the Annual Meeting of the Ent. Soc. Ont.

The earliest species which I noted during the past season, was the common and obnoxious currant saw-fly, *Nematus ventricosus*, which appeared on 15th May. Two days later I captured upon willow in bloom a specimen of *Dolerus collaris*, and on the 21st and 22nd found *D. aprilis* quite common on and about alders, with a few *D. sericeus* ? and *D. abdominalis*. By the 24th May the strawberry saw-fly, *Emphytus maculatus*, and the raspberry saw-fly, *Selandria rubi*, were in considerable numbers, and at the same time appeared several less well known species in fields and woods, such as *Hylotoma McCleayi*. This species I found again on 2nd June and subsequent days, upon the flowers of choke-cherry. Later in the season specimens were found upon *Spiræa*. *Selandria flavipes* was captured on 10th June, and was abundant during the season. It

could always be obtained by using a sweeping-net among the common fern. At the same time could be obtained in abundance upon the ferns greenish larvae which I have no doubt were those of that species. These larvae when full grown are about two-thirds of an inch long. The body is finely transversely wrinkled; bright green above and whitish below. The head has a brown patch on vertex and behind the eyes, which is reduced in some specimens to two dots on vertex and one behind each eye. By the middle of June the species were numerous, including *Tenthredo verticalis*, *T. rufopectus*, *M. flavicoxa*, *Pacilostoma albosectus*, this rare insect being taken on 13th; and *Tenthredo (?) delta*, of which seven ♂ were taken on 16th. Hickories suffered considerably during the latter part of the month from the larvae which I think to be those of *Acordulecera dorsalis*. They are one-third of an inch long. The body is whitish, with green dorsal stripe, is slightly pubescent and has the lateral margins dilated. The head is black and the thoracic feet are whitish. The abdominal feet are very minute. On the 24th I found several colonies of *Nematus Erichsonii* on larches not far from the line of the Canada Atlantic Ry., along which route the fly appears to have reached Ottawa. These I destroyed, with the exception of one brood, which I took home and which commenced to spin their cocoons on 2nd July. Two or three days later I found a few other broods of small larvae, and twigs bearing eggs which were also destroyed. On subsequent visits I found no further traces, and hope that I have checked the increase of the species in that locality for another year. On the 27th June I found cedars at Hull greatly infested with the larvae of an undetermined saw-fly. I have mislaid a description of these larvae and have only the following brief note of four specimens taken the previous August: "Yellowish green, with darker undefined dorsal and lateral stripes; black thoracic feet, eight pair abdominal feet, head ferrugineous, length 15 m." It seems to be the species mentioned by Packard on page 257 "Insects Injurious to Forest and Shade Trees," as *Lophyrus abietis*, but the larvae differ somewhat in color from those of that species taken upon spruce. I have always found the larvae of *Lophyrus abietis* captured on spruce comparatively easy to rear, but with those from the cedar I was unsuccessful. When placed in the breeding-jar, they left their food and clustered upon the side, and would only feed when the jar was wrapped up or placed in the dark, and they gradually died before spinning their cocoons. The larvae of *N. similis*, the locust saw-fly, were common during the summer. An imago

was seen on 24th June, and a larva taken the same day spun its cocoon on the 30th. On 1st July, I noticed a young ash in front of a neighbor's house with its leaves badly eaten. It immediately struck me that this might be the action of larvae of *Selandria barda*, and on examination I found upon the under side of the leaves a number of large whitish larvae corresponding to those described by Mr. Osborn (CAN. ENT., vol. xvi., page 150). They fed a few days longer and then went into the earth. During July larvae of various species were very plentiful, and in some instances the plants attacked by them were much defoliated. The flies were also abundant and many species were captured, such as *T. verticalis*, *T. ventralis*, *T. basilaris*, *H. trisyllaba*, and *Emphytus tarsatus*; the last is a large handsome insect resembling superficially the members of the genus *Tenthredo*. In August saw-flies diminished in numbers, but several species could still be obtained, and *Allantus basilaris* was, as usual, common on golden-rod, etc. About the middle of Sept. (12th?) a number of plants of turtle-head (*Chelone glabra*) were found infested by the larvae of some unknown species. These, unlike the majority of saw-fly larvae, were very pretty caterpillars, mottled, or marbled, with velvety black and white, and with jet black heads. The same species has been found by me in July feeding upon meadow-rue (*Thalictrum cornuti*), but I have not succeeded in breeding it. A few larvae of other species were seen up to the first of October, but the repeated sharp frosts apparently caused them to disappear. My captures of saw-flies during the season number altogether about 300 specimens, with perhaps one-fourth as many species. Of these many are rare insects, while several species are yet undetermined.

CHRYSOMELA ELEGANS, ROGERS.

Dear Sir: In the Society's report for 1882, Mr. W. H. Harrington states that he had found this species to be common at Ottawa, but had not discovered its food plant. I find *elegans* to be abundant in this neighborhood on Beggar Ticks, *Bidens frondosa* and *B. cernua*. There appears to be two broods, if not more, as I have found them plentiful in June and again in August and September; the beetles of the last brood evidently hibernate, as I have taken stray specimens in early spring. The food plant was kindly determined for me by Dr. J. B. McConnell.

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No. 3

ON PHYSONOTA UNIPUNCTATA SAY, AND ITS SUPPOSED VARIETIES.

BY F. B. CAULFEILD, MONTREAL, P. Q.

As considerable doubt appears to exist with regard to the three species or races of *Physonota* described by Say, Randall, and Walsh and Riley, and as I had in former years found a species of this genus to be rather common in the vicinity of Montreal, I endeavored during the past season to find it again, and, as far as my opportunities would permit, work up its life history.

Early in May I made a careful search in the locality where I had previously found it, but at this date its food plant had not yet appeared above ground. I tried again in June, the time at which I had formerly taken the first brood. The food plant, *Helianthus decapetalus*, was now about two feet high, but the leaves were untouched, and to my great disappointment no beetles were found, as I particularly wished to ascertain the color of the early summer brood, as those which I had formerly taken at this season were of a bright gold color, quite different from those taken later in the year. This difference of color in the broods appears to me to point to the conclusion that *Physonota* may possess the power of assuming different tints, as is the case with some other species of the family. On August 15th I found a colony of the beetles on the same plant, now in full flower. The beetles were all in the autumnal dress, black and white, with testaceous margin. The species is undoubtedly that described by Walsh and Riley as *P. quinquepunctata*, which is, I think, a synonym of *helianthi* Randall. This author describes it as having the "elytra blackish, irregularly spotted with white, with a testaceous margin, losing its color after death, becoming nearly pale testaceous, except the three black spots on the thorax." This agrees very well with the species found by me, except that they have a double spot close to the anterior margin of the thorax, but as this fades soon after

death to olive green, and in old specimens becomes almost imperceptible, while the three posterior spots retain their color, the term *5-punctata* loses its significance. Indeed, on reading Dr. Hamilton's remarks on the species in the CANADIAN ENTOMOLOGIST, I examined some specimens taken several years since, and came to the conclusion that they were Randall's species. The description given by Walsh and Riley, American Entomologist and Botanist, vol. 2, p. 4, has, I think, been taken from cabinet specimens, as they give it as "more or less pale dull olive color, dotted with pale yellow. *Thorax* with three black spots behind the middle. Before the middle black spot a double dark olive spot, composed of two trapezoidal spots transversely arranged, and not unfrequently more or less confluent with each other." I have taken the beetle abundantly last summer, and bred a number from the larva, and all mature specimens were pure black and white when living, but they fade soon after death, when they answer to the description given by Walsh and Riley, but in time the anterior spot almost entirely disappears. This double spot appears to be the only difference between *helianthi* and *5-punctata*, and may perhaps have been overlooked by Randall; there may, however, be a form with only three spots on the thorax, as described by him. All taken by me had the double spot, but in many it was confluent.

I found the beetles to be very sluggish, none being observed moving about or feeding. Although living in communities, but one beetle was generally found on a leaf, and they appeared to prefer the leaves situated near the head of the plant. Along with the beetles I found a solitary larva, of which I took the following description: Body depressed, oblong oval. Length almost half an inch. General color dark olive green. Head black. Throax dull greenish yellow, lightest in front. Abdomen dark olive green, with three short yellow stripes on dorsal surface, the central stripe commencing nearest the thorax, thus, ———. Tail bifurcate, yellowish green at base, prongs black. Lateral surface with a row of ten simple spines, the first short, black, the next three longer, black at base, central portion white, tip black, remaining spines short, black. Under surface pale olive green, terminal segments black. Legs pale olive green, feet black. When undisturbed this larva kept its tail curved over its back, but frequently altered the angle at which it was inclined. When disturbed it jerked the tail forward and downward until it nearly touched the body. Both body and tail were wet with semifluid excreta, and when thus covered, the prongs of the tail and the lateral

spines would be easily overlooked. When placed in a box it soon lost its wet coat, when the form and color could be distinctly seen. It fed freely until the 23rd of August, when it rested quietly on the bottom of the box. The tail was now extended straight behind the body, and the larva was clean and dry. At this time, if disturbed, it raised the tail slightly, but did not otherwise move. I examined it every day, but noticed no change. On looking at it on the morning of the 27th August, it had changed to a pupa. Length of pupa a little over a quarter of an inch. Form oval, sub-depressed. Thorax slightly wider than abdomen, margin of the thorax dilated. Disk of thorax with three black spots near posterior margin. A double green spot close to anterior margin, but not touching it. Dilated margin green; from the centre of the lateral margin a black line extends through the green a little way on the white. Posterior margin edged with a narrow line of black. Abdomen immediately behind thorax, green, centre white, remainder of abdomen pale yellow. A row of five black spots close to lateral margin, centre with three interrupted transverse black lines. Elytra green, spotted with pale yellow, sutural margin bordered with a narrow black line. Just behind the elytra, on the lateral margin of the abdomen, there is a slightly elevated, oblong, pale yellow spot, upon which is situated two very short white spines. On looking at it at noon on September 11th, the beetle had apparently just emerged, as the elytra were, with the exception of the white spots, pale green and semi-transparent. The wings were not yet folded, extending beyond the body. At 6 p. m. the elytra had become much darker and were but slightly transparent, and the wings were now folded beneath the elytra. On the 13th its colors were pure black and white. On the 24th of August I found a colony of eleven larvae, identical with the first one found, one beetle and one pupa. The latter was on a leaf which had been partly eaten by larvae; it was attached to the leaf by the posterior extremity, the larval skin being pushed behind and slightly beneath. It rested on the upper surface of the leaf, with the head pointing to the base of the leaf, and was partly concealed by the withered edges of the leaf, which were curled inwards. This was the only pupa found, although I searched carefully on several occasions, but as the food plant was abundant I may have overlooked them. *Physonota* may perhaps leave the food plant before transforming, but this would not be in accordance with the habit of allied species, which usually attach themselves to the under surface of a leaf. The specimens reared in confinement did not appear to be particular as to

situation, some pupating on the bottom of the box, others beneath the lid, while others again attached themselves to the side, in every instance producing a perfect beetle. The lot of larvae taken August 24th had all changed to pupa on September 8th. They began to emerge on September 17th, and were all out on September 20th.

On August 26th, I found a large colony of larvae and beetles. The larvae were of two sizes, some very small and others about full grown, but about the only noticeable difference, apart from size, was that in the young larvæ the yellow markings were scarcely to be seen. The small larvae had lately moulted, and the cast skins were on the leaves, showing that in this respect *Physonota* differs from *Coptocycla* and *Cassida*, the larvae of which slip the cast skins on the tail. Until nearly full grown, the larvae of *Physonota* are social, keeping together in compact groups, the heads in the centre, surrounded by a circle of uplifted tails, presenting a most curious appearance. When nearly full grown they separate and scatter over the plants. By most of the later writers on the insects in question, but one species is recognized, *P. unipunctata* Say. Prof. Riley, in the Supplement and Index to Missouri Reports, p. 53, says: "*Physonota quinquepunctata* Walsh & Riley (Rep. ii., p. 59).—This is synonymous with *Ph. unipunctata* (Say), there being no question as to the specific identity of the two, both having been bred by Mr. F. H. Chittenden, of Ithaca, N. Y., from larvae on wild sunflower (*Helianthus*).” That *P. quinquepunctata* W. & R. is synonymous with *P. helianthi* Rand., is I believe correct, but its identity with *P. unipunctata* Say is I think still an open question. With regard to this point Dr. Hamilton writes me: “But even if they were so bred, it does not prove identity, because (if species) both are found in the same vicinity, and may have mingled on the same plant. Besides it may have been *helianthi* instead of *unipunctata*, since both go by the same name.”

The records of these species appear to me to point to the conclusion that they are distinct. Say describes his species as yellow, with the margin whitish. Dr. Hamilton, CAN. ENT., vol. xvi., p. 135, speaking of a colony of *unipunctata* found by him, states that all taken were of Say's type, pale above with one black spot on thorax. He also tells us that a few of the larvae were feeding with them, their colors bright yellow. As in all the *Cassida* the colors change after death, I wrote to Dr. Hamilton, asking him what the color of the specimens found by him was in life. In answer he informed me that all taken by him were entirely pale, except the black

thoracic spot. From these accounts it would appear that there is considerable difference between these forms, the larva and beetle of *unipunctata* being light in color, while *helianthi* is dark. With regard to food plants, so far as known *helianthi* is confined to sunflower (*Helianthus*). Randall says: "Many specimens of our species occurred at Farmington, near the margin of the Sandy River, on a species of *Helianthus*; a great many of these plants were almost wholly deprived of leaves by their ravages."

So far as I am aware, there is no authentic record of typical *unipunctata* having been observed feeding on *Helianthus*. *Unipunctata* was taken by Dr. Hamilton feeding on mint, *Monarda fistulosa*. He further informs us that they "must have fed on the *Monarda* from choice rather than necessity, because three species of *Helianthus* grew with it and were not eaten by either larva or beetle." Prof. Riley, American Entomologist and Botanist, vol. ii., p. 4, states that he has "observed the one-dotted Tortoise-beetle (*Physonota unipunctata* Say) feeding in the larval state upon a Sow-thistle (*Sonchus*)." Both forms seem to be widely distributed; Say records *unipunctata* from Missouri; Dr. Hamilton records it from Allegheny, Pa., but states that it had no doubt been brought from some more northern region during the annual spring inundation. *Helianthi* is recorded from Rock Island, Ill., by Walsh, or its var., *quinquepunctata*. Messrs. Hubbard & Schwarz record *unipunctata* from the lower peninsula of Michigan, but do not state which form was taken. Montreal is the only Canadian locality from which I find *Physonota* recorded. In D'Urban's list of Montreal Coleoptera (Canadian Naturalist, vol. 4, p. 307) he gives *Cassida unipunctata* as common on the Mountain. This probably would be *helianthi*, as I have found it common on Montreal Mountain, but have never met with a typical specimen of *unipunctata*.

I hope that entomologists will look out for these species during the coming season, and if successful, let the readers of the ENTOMOLOGIST have the benefit of their observations.

The food plant was kindly determined for me by Dr. J. B. McConnell.

NOTE ON XIPHYDRIA ALBICORNIS.

BY W. HAGUE HARRINGTON, OTTAWA.

This species was abundant from the middle of June to the end of July, and I observed the females ovipositing on our shade trees (maple)

in various parts of the city. It appears to prefer trees which have been recently transplanted, and which are naturally not so vigorous as those which grow undisturbed. My next-door neighbor set out several young trees, from one to two inches in diameter, and upon these I took several specimens. On the other hand, I observed them, beyond the city, ovipositing in quite large and old maples, and even upon the limbs of an old tree which had been broken and blown down. Thus, it appears, that the size of the tree does not make much difference to them, and that in the city they attack the smaller trees because they are less vigorous than those that have recovered from the effects of transplantation.

PROTECTIVE COLORATION IN THE GENUS CICINDELA.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

In the summer of 1884, while collecting the green tiger-beetles in the woods, it struck me very forcibly how the *Cicindelæ* that inhabit such places—*sexguttata* Fab. here, *campestris* Linn. in England, others elsewhere—are for the most part of a beautiful green, so as to assimilate in color with the surrounding vegetation and herbage among which they may alight; while those that frequent the bare ground, banks, sand hills, sandy stretches, beaches, bars—*vulgaris* Say, *repanda* Dej., *maritima* Dej., and many others—are of the colors easily assimilative with those that surround them on the flats and stretches where they are found.

Although those of the class first referred to often alight upon bare ground, it is mostly at such places as have been cleared by man (I am speaking of *sexguttata* Fab. now, this being the only species of a conspicuous green that I have had the opportunity to observe in its native habitat), their original haunts being the fresh, green woods, where nearly everything is clothed in greenness in its natural state. There they can hardly be distinguished when they are alighted, even though on a log, for the dazzling greenness of the forest at the time these insects appear fastens that color upon the eye, so that for the moment they become invisible, though you may be looking directly at them—invisible, certainly, so far as recognition is related to invisibility; every collector knows that it takes practice to distinguish these insects in their native haunts. Even though the surrounding vegetation is sparse, the effect is the same. This arises

from the liability of the mind to class everything green in the woods as belonging to vegetation, or, in other words, from our inherent tendency to place animals or locomotive beings as different in color from plants. When, as is often the case, they are alighted on sandy banks in or near the woods, the effect is similar; the surrounding greenness makes them difficult of detection here, as well as in other spots, even away from woods, where they may be side by side with vegetation. The momentary invisibility which the insect therefore possesses gives it a chance to escape, if it chooses to make use of this chance. But as long as everything remains quiet it seldom flies, trusting rather for protection to its habit of remaining perfectly motionless, combined with its similarity in color with surroundings. In the natural state man is not its enemy, but its assimilative coloration probably protects it in a great degree from its many known enemies among the birds and reptiles.

A fine and rare English species, *germanica* Linn., which is said to frequent most a certain favored locality in the Isle of Wight (Black Gaug Chine), unlike most of the genus, prefers wet to dry places, and has a liking for brackish marshes.* It is of a beautiful rich green, and thus is enabled to escape observation amid the vegetation which thrives in such places.

Of the other class, our most common species, *vulgaris* Say, is as nearly invisible as an insect can well become by assimilation in color with its surroundings. It is only the practiced eye that can distinguish it from the soil or sand upon which it alights; for, in either case, those parts of a different color from the surface upon which the insect is resting will be mistaken for particles of foreign matter, giving the eye no chance to rest upon form. I have often, before I became used to the practice, looked most carefully for a long time when I had distinctly seen a specimen of this species alight, but without being able to distinguish it until it moved.

A southern species, *tortuosa* Dej., which I have taken in Louisiana, has very little of the lighter markings upon it, but is nearly all of the sombre shade of the sandy mud flats over which it runs and flies.

A fine western species, which I have taken in Kansas on the sand-bars of the Kansas River, at Lawrence, during low water in the summer months, is *macra* Lec. In this the markings have united so as to form an etched border to the elytra of just the light color of the fine sand of

* Rye, British Beetles, p. 47-48.

the bars, so that it can hardly be detected where alighted, the darker parts being easily taken for bits of drift-wood or pebbles.

These notes being intended only as a mention of this interesting subject, I will not bring up any further species, for they will nearly all be found equally well adapted in this way to their surroundings. Species are to be found all over the world, many of which would furnish more interesting cases than the above. I might mention that I have lately received from New Zealand two fine species, *tuberculata*, Fabr., and *parryi*, White. In the former the markings have united, while in the latter they have become somewhat indistinct, the elytra having a very thin and delicate appearance, as indeed has the whole insect, leaving the markings not well defined. These species would be hard to detect alike in sandy places or on darker soils, though *tuberculata*, Fabr., is better adapted to the former, and *parryi*, White., to the latter.

Many of the species differ from others in the number of the elytral markings; but it is the base color that concerns us here, for it is this that makes the insects hard to discern from their natural surroundings, while the lighter markings help the effect. Thus those of the bright green woods have the base color of the same dazzling, brilliant green, while others have it of the duller color of the soils they frequent, or are considerable modified, as *macra*, Lec., and the nearly related *cuprascrus*, Lec., *puritana*, Horn, *wapleri*, Lec., and especially the two Mexican species figured by Schaupp, in his synopsis, * so as to have the markings unite, and, so far as the effect goes, take the place of the original background and themselves become the real base color, conforming more to the color of the white sand of the bars upon which they are found. It is noticeable that in all this variation the elytral markings, when they occur, keep the one creamy white color, however the base color may change. If the markings are united, becoming the base in effect, the other parts retain their dull color as before. In short, there is generally an irregular light edging to the insect, often broken, which gives it an irregular outline, so that it will not readily assume form. Had we never observed these species in their natural habitat, this alone would prove to us that they were terrestrial in their habits.

They do not take for ornament conspicuous colors upon conspicuous

* Schaupp, Synopsis of North America *Cicindelidae*, Pl. III., figs. 85 and 86. (From Bull. Bkl. Ent. Soc., vol. VI.)

parts. The under parts are generally of a deep green or bluish, irrespective of the insect's habitat. These colors do not show from above. On this account many of the species seem to be more brightly colored beneath than above, except in such cases as afford the bright colors above a chance to assimilate with soils or foliage. Yet the upper parts are really the more richly colored in all the species, though they may not appear so to the casual eye. Here, in the coloration of the upper parts of the *Cicindela*, natural and sexual selection blend. They act together at the same time upon the same parts. While sexual selection produces beautiful tints, natural selection takes care that none remain that will endanger the insects preservation by making it conspicuous in its retreats. In this way colors, which otherwise would be prominent, assume a general dull appearance, which will not arrest the eye. Life is of primary value, but so also is beauty to the perpetuation of the insect. While the upper parts retain the colors that will assimilate well with their surroundings, sexual selection has given them tints, which though in many cases seemingly dull to the eyes of man, are found under a high lens to consist of the most lovely bronzed, purplish and dazzling green reflections, in the entirety of which beauty the insects appear to themselves by virtue of their far superior sight development.

LARVA OF SEIRODONTA BILINEATA, PACK.

BY G. H. FRENCH, CARBONDALE, ILL.

Length 1.20 inches ; cylindrical, rather slender, two warty elevations on the dorsum of joints 5 and 12, elsewhere the piliferous spots scarcely perceptible, except for the single hair that arises from each. Color green; a dorsal pale yellow line, bordered on each side on joints 3 and 4 by a purple line ; outside this a pale yellow stripe that diverges on joint 2, gradually diverging again on joints 4, 5 and 6, where it reaches below the usual region of the subdorsal line, extending from this back to joint 11, from which it gradually converges to the elevations on joint 12, touching these on the outside, the diverging and converging referring to the stripes on both sides of the body. These stripes send more or less prominent deflections down the sides of joints 7 and 10. In some examples the space between these stripes and the dorsal line contains a pale whitish stripe each side of the dorsal ; the deflections, and a little on joint 5 and

the elevations, are reddish purple. In other examples the whole space between the lines, except four or five greenish patches, is reddish purple, there being various intergrades. In all cases the purple is mottled. The sides are specked with purple; stigmatal line yellow with traces of one above this. Head with a dark purple line each side, outside of which is a yellowish line.

The larvæ from which this description was taken, 13 in all, were taken on a young elm tree September 29, 1884. By October 5th all but one had disappeared for the purpose of pupation, going beneath the surface of the dirt in the breeding cage. Nine imagines were produced the following spring, the times of emergence ranging from May 24th to June 7th. There seems to be two broods in a season, for larvæ were found on elms during the early part of summer, but these were not reared to find out the period of the summer brood.

NOTES ON PAPILIO TURNUS AND PYRAMEIS CARDUI.

BY MRS. C. H. FERNALD.

Previous to the summer of 1884, *Papilio turnus* and *Pyrameis cardui* had been quite rare in Orono, Me., and vicinity, not more than half a dozen of the former and two or three of the latter having been seen each year; but in June of that year *P. turnus* was so abundant that it was not uncommon to see a dozen or more flying together. In August of the same year fresh specimens of *P. cardui* were so abundant that in a small piece of red clover, not more than two rods from the house, I captured twenty-five in half an hour, and the numbers were not perceptibly diminished. The next day they were equally abundant, but the following day we had a cold rain storm, after which only a very few poor, faded examples were seen. The next summer (1885) *P. turnus* was again rare, and not one example of *P. cardui* was seen by myself, nor by any one in this vicinity. Parasites might have made the difference in the number of *P. turnus*, but could they have done so with that immense number of *P. cardui*, or did that storm so effectually destroy them before laying their eggs that there were none the next year, or is it possible that some epidemic attacked them, leaving none to perpetuate the race? We can understand the gradual increase and decrease of certain species which is noticeable every year, but the sudden abundance and scarcity of some

species is a subject of great interest, and one about which but very little is known at present.

I have in my possession a male *Papilio turnus* which has only two wings. An examination shows that the hind wings are undeveloped ; on one side the membrane is pushed out and rounded at the end about as large as the head of a pin, and on the other side the membrane is no longer, but is broader and somewhat flattened, showing plainly that the wings have not been broken off, but have never developed. This specimen was captured on the wing, while hovering over lilac blossoms, and appeared to fly as well as perfect specimens.

In the summer of 1884, I captured a male *Papilio turnus* which differs very much from any I have ever seen or read of. The outer half of the upper side of all the wings is black, except the row of yellow spots on the outer margin of the wings. These are round or nearly so, instead of elongated, and there are only six on the fore wings. The inner half of the fore wings is like the ordinary *P. turnus*, except that the two black streaks are united from the costa down about half their length. The under side of the fore wings is like the upper side, but slightly dusted with yellow. The under side of the hind wings has the blue extended nearly as far in as the black upon the outside, and, together with its black border, is very strongly curved or toothed towards the base. All the yellow on the wings is darker than on the common form, and the insect when flying looked more like a male *P. asterias*, except in size, than like a *P. turnus*.

It was captured in June on the bog where *Chionobas jutta*, *Chrysophanus epixanthe*, and several other rare lepidoptera are found.

NOTES ON CERESA BUBALUS, SAY.

BY JOHN G. JACK, CHATEAUGUAY BASIN, QUE., CAN.

Read before the Montreal Branch Ent. Soc. of Ont., 9th Feb., 1886.

During the past two years, but more especially this season, we have been very much troubled and annoyed by the attacks of the Buffalo Tree-hopper (*C. bubalus* Say) on the young trees in the orchard. Most of the trees have been seriously injured by having the bark cut up by the ovipositors of these insects, when depositing their eggs. These incisions

and the eggs in them were so numerous that in many cases it was impossible to raise the bark for the purpose of "budding" the trees.

The incisions and eggs are usually most abundant on the south and the upper side of the limbs, comparatively few being found on the shady or under sides. The first imagines were noticed in the orchard on July 16th, and a few days later they became quite abundant. On the young tender twigs of the apple trees, especially those nearest to the ground, large numbers of the insects were found busily extracting the juices with their slender beaks. Upon close examination the twigs plainly showed the traces of their punctures. They were also very abundant on beans, potatoes and several kinds of weeds, in many cases completely covering the stems, and all engaged in feeding upon the juices of the plants. Bean-stalks that were attacked in this way were considerably injured, as numerous dark knotty formations occurred at the places that were much punctured, so that the growth of the plant was decidedly checked.

The insect was first noticed depositing eggs about August 12th, and a few incisions were then to be found on the branches. This depositing of eggs continued until Oct. 8th, when a severe frost killed a great many of the tree-hoppers, although a few escaped and continued the work until Oct. 26th. After that date they were not noted.

Some of the eggs of the season of 1884 were collected last spring and kept in a very tight box. They were hatched during the first week in June, and with them were a number of small Dipterous flies, evidently parasites upon the eggs of *Ceresa*. I watched for these parasites in the summer and autumn, and first found them August 31st, on limbs where the tree-hoppers were depositing eggs. The parasites were found in larger numbers a little later, and I had the satisfaction of distinctly seeing a number of them insert the abdomen and sometimes almost the entire body deeply into the gaping slits made by the ovipositors of the tree-hoppers. Prof. Riley thinks that the parasite may be an undescribed species.

As I did not know the best conditions or food for the young larvæ of *Ceresa*, I placed them in a glass jar and gave them the tender twigs and leaves of apple trees. From these they seemed to extract the juices, and they could be seen in rows on the ribs of the leaves, with extended beaks, while little particles of a clear gummy substance were often found at the places where the insects had been sucking the juices. I afterwards added bits of grasses, etc., to their food, but after some time they ceased feed-

ing, and finally they all died, none of them being more than half grown. This was about July 5th, and about this time I found a number of the larvæ about some raspberry canes in a shady place, and on July 13th I took more of them among low juicy grasses and thistles, growing thickly in a cool, moist place, several rods from any trees of any kind. On July 17th, nearly all these larvæ changed to the adult form.

The larva becomes much elongated as it begins to cast the last envelope, and one of them, noticed when just beginning the operation, took three hours to complete it.

The full grown larva is about 8 m.m. in length, and light green in color, somewhat lighter than that of the mature insect. The young larvæ appeared to be of a darker green than they were at a later period of their growth. The general shape is triangular, like that of the mature insect, but the broad horn-like projections are not seen in the larva. The eyes are prominent. On the front of the elevated thorax, and behind each eye, are two short, strong spines, one above the other, armed with several lateral prongs or forks; higher up, near the apex of the triangular shaped thorax, are two more, somewhat larger armed spines, and the last two visible thoracic segments are each provided with a pair of these branching spines that are still longer. There is also a pair of these spines, each armed with about 6 or 7 barbs, on each of the abdominal segments next to the terminal. These are graduated in length, the shortest being on the last segments, and the longest hardly more than a millimeter in length. The thoracic spines project forwards, while those on the abdominal segments are drawn forward at the base and then curve back, strongly suggesting the dorsal fin of a fish. On the last segment, which is long and tapering, there are two short armed spines directly above the anal opening, which is terminal. The ventral surface of the abdomen is scatteringly covered with short, strong bristles or hairs. The legs are also covered with stiff hairs.

The eggs, in batches of from 5 or 6 to a dozen (rarely more), are deposited obliquely in the bark, and often the incision continues into the wood, if the bark is thin. In this way the bark and wood become fastened together, and will not separate at any season, and the dark spots in the wood and the rough knotty bark bear evidences of the injuries for many years.

The eggs are of a dirty transparent white, about 1.5 m.m. in length, smooth, slightly tapering, and sharply rounded towards the interior end,

but tapering much more gradually at the exterior end. Although normally round, the sides are generally found to be more or less flattened by pressure from the tissues of the wood and bark of the tree. So numerous were these eggs on some trees that a careful estimate shows that there must be at least from six to eight hundred eggs in a section of the branches not more than an inch long and half an inch in diameter.

I have not been able to find a remedy, and perhaps the best is to destroy as many of the egg-bearing limbs as possible. It is to be hoped that the little parasitic flies will increase, and this seems probable. On Sept. 17th I found 5 or 6 tree-hoppers ovipositing on a piece of branch about 4 inches long, and on the same section were 12 or 15 of the parasitic flies.

THE COLIAS CONTROVERSY.

BY R. H. STRETCH, SAN FRANCISCO.

It is to me a most distasteful task to take part publicly in the "Colias" controversy between Mr. Edwards and Dr. Hagen, as I was an invited guest of Dr. Hagen on the trip to Washington Territory, where the events took place which have given rise to the discussion; but in the interest of science, which seeks nothing but the truth, it seems as though the time had come when I ought to state in a concise manner what I know of the whole matter. I have been cut off from all my books for the last five months, while travelling from place to place, or this letter would have been written earlier. I did not know till quite recently the phase to which the controversy had arrived. Probably the best thing I can do is to state the manner in which our party was organized, and the manner in which our collecting was done.

The party consisted of Dr. Hagen, and his assistant, Samuel Henshaw. In San Francisco I was invited to join it, and did so.

Mr. Henshaw was a skillful coleopterist, a department of entomology of which I knew but little, so by mutual agreement I became practically the lepidopterist of the party, as he was the coleopterist, and we both collected such other groups of insects as came in our way. Purely scientific work, or mere collecting, was discouraged, as the party was an "Economic Entomological Expedition," a fact repeated over and over again to the wonder-stricken pioneers of the wilderness.

Our collecting appliances consisted of nets, envelopes, "cyanide" bottles and pill-boxes. Mr. Henshaw and myself each had a cyanide bottle. The collecting was practically done by Mr. Henshaw and myself, as Dr. Hagen was physically unable to enter into it, however much he might have wished to do so. Personally I collected everything in the "cyanide" bottle, *except* lepidoptera. These were transferred direct from the net to envelopes. Mr. Henshaw not only collected everything in the cyanide bottle, but not unfrequently placed his lepidoptera therein when he was out of envelopes, and would hand them to myself out of the bottle when we met. I have an unmistakeable recollection of this fact, and it was for this reason I dubbed it "omnivorous."*

When collecting (I remember especially at Yakima City, where *Colias* was unusually common), I not only put into a single paper envelope specimens taken "in copula," but also those playing together and taken with the same sweep of the net, so that the fact of being in the same envelope is not proof of copulation, in all cases, so far as I am concerned.

When we reached camp after collecting, I used to prepare and number the lepidoptera first, and then assisted Mr. Henshaw with the beetles and other insects, which were packed "en masse" in pill-boxes, the latter labeled as were the envelopes with the number of the camp.

During the trip there was entire harmony and free discussion between Mr. Henshaw and myself. I believe I am correct in adding that at that time none of the party knew exactly what species of *Colias* we were collecting.

Now to the gist of the whole matter, which is a question as to the action of cyanide of potassium on the yellows of the genus *Colias*, and in particular, on one individual specimen of this genus taken during our wanderings in Washington Territory.

Now, although we discussed *Menapia*, *Machaon* and *Leto*,† I never heard of this "cyanide changed *Colias*" until its discussion in the periodicals. To me it would have been of peculiar interest, as I happened to have suffered severely by the action of cyanide on yellow insects on a former occasion, when in Fresno County I collected several hundred yellow marked hymenoptera in excessively hot weather (the bottle perspiring

* See *Papilio*, iv., p. 170, for this expression. In *Ent. Amer.*, i., p. 119, Mr. Henshaw seems to object to the word "omnivorous."

† Henshaw, paper before cited.

freely), and had them all transformed to a lot of brilliant red and black forms, mottled with unchanged yellow. Again, if it had been the initiation of a scientific experiment, so keen an observer as Dr. Hagen would surely not have been content with a single experiment, when *Colias* was common everywhere; but having had his curiosity excited, would have prosecuted the investigation to its legitimate conclusion.

Again, the statement that "the supposed change of color appeared after the specimen was dry," is inconsistent with the action of cyanide of potassium on yellow insects, as the change is palpable while they are wet, if they change at all; and it almost involves the conclusion that the change was not discovered till months afterwards, as the specimen in question must certainly have been "enveloped" the same day, and the envelope remained unopened until it reached the Museum.

In conclusion, I may say that for all scientific purposes this specimen should be ignored as having less than an infinitesimal value. Mr. Henshaw states the case exactly (*Entom. Americana*, vol. 1, p. 119) when he says: "In regard to the *Colias* similar in color to *Astraea*, I have only to say that a yellow *Colias* recognized in the field as closely corresponding to, if not identical with others previously collected, was placed in a damp, freshly prepared cyanide bottle, and when taken from the bottle the hind wings were wet; the specimen was preserved and the facts noted at the express wish of Dr. Hagen." I have never seen Dr. Hagen's original paper, so that I do not know at what point the particular *Colias* in question was taken, but the accidental breakage of Mr. Henshaw's collecting bottle explains the preparation of a new one; his habit of collecting lepidoptera in the same bottle with beetles explains why the *Colias* happened to be in the bottle, and it only remains for us to decide what insect went into the bottle, that is, what particular form. Mr. Henshaw says: "Close to if not identical with others previously collected," but as I find in my note-book, "July 4—Took very fine series of *Colias* (3 forms)," the question is evidently left open. It might have been either one of these or some other. Mr. Henshaw's admission just quoted, with my own additions, give faithfully the history of the "specimen," and show that any scientific deductions based thereon rest on a most unsubstantial foundation.

San Francisco, Dec. 9, 1885.

A MONOGRAPH OF THE APHIDIDÆ, BY JULES
LICHTENSTEIN, MONTPELLIER, FRANCE.

BY J. T. MONELL, BONNE TERRE, MO.

Judging by the first volume of this work, which I have lately received, it will prove of great value to American students of this difficult family. The first volume is illustrated by a number of finely colored plates, and Mr. Lichtenstein promises in his preface to use all such funds as he may obtain from subscribers to the work, in illustrating the second volume—thus practically making subscribers a present of the text. While the monograph will deal more particularly with European species, many notes will be given comparing nearly allied American with European forms.

Considering Mr. Lichtenstein's eminence as an Entomologist, and the many years he has devoted to this family, this work can not fail to receive a hearty welcome from the Entomological public.

DESCRIPTION OF A NEW CHALCID, PARASITIC ON
MANTIS CAROLINA, SAY.

BY WM. H. ASHMEAD, JACKSONVILLE, FLORIDA.

Sub-fam., TORYMINÆ.

Podagrion Spinola.

PODAGRION MANTIS, n. sp.

♀. Length .15 inch; ovip., .14 inch. Dull metallic green, finely punctate and sparsely covered with short, whitish pubescence; antennæ and legs dull yellow; flagellum brownish above, all coxæ metallic green, sculptured, posterior ones large, tips of feet black. The posterior femora are greatly swollen as in the Chalcidinae, armed with about eight large teeth, brown at sides but brassy along upper surface, pubescent, tibiæ greatly curved; abdomen metallic green variegated with brown, compressed and shaped as in the ichneumon genus *Ophion*; wings hyaline, veins brown, marginal and post-marginal veins long, stigmal vein short, thick.

Described from one female specimen bred from egg mass of *Mantis carolina* Say. This is an interesting discovery, and the first species of the genus to be described in our fauna.

Dr. Mayr, in "Die Europäischen Tormiden," in a foot note gives the synonymns of this genus as follows :

Podagrion Spinola. Ann. du Museum d'Hist. Nat., xvii., 1811, p. 147.

Palmon Dalman. Vet. ac. Handl., 1825.

Priomerus Walker. Ent. Mag. I., 1833, p. 118.

Bactyrischion Costa. De quib. nov. Ins. Gen., 1857, p. 5, f. 4.

Several species in this genus are known to science, and it is a remarkable fact that the habits of only one species are known, *Podagrion* (*Palmon*) *religiosus* Westwood, and that that also should be parasitic on *Mantis* eggs (*Mantis religiosus*).

NOTES ON THE LARVÆ OF HARRISIMEMNA SEXGUTTATA, HARR.

BY CHARLES F. GOODHUE, WEBSTER, N. H.

During August and September the larvæ of this fine moth are often seen feeding on the lilac. When full grown it is of peculiar shape and markings, and taken altogether, a hideous looking object, and one which few people besides an entomologist would care to have anything to do with.

Mature larva, 1.75 inches long.

Head and adjoining segment black, segments 3 and 4 yellow with black points, segments 5, 6 and 7 are brown varied with white, and 8, 9 and 10 are white, 11, 12 and 13 are brownish black. It is deeply incised between the segments, and the abdominal feet are long, especially the first two pair. Segments 6 and 12 are much produced dorsally, being very pointed; this, together with the habit of arching the body between the anterior feet and the long abdominal ones, causes it to present a very irregular and jagged outline.

On the top of all the segments are a few rather long scattering hairs. It has the peculiarity of retaining the cast off skin of the head and part of second segment on these hairs, which are not shed with the rest of the skin; first near the tip of the hairs the head case is small, a little below this is another, and so on. We have quite often seen three of these cast off skins on a larva at one time.

They will, if ever so slightly disturbed, raise the front part of the body back to the abdominal feet, and thresh it violently from side to side; in fact, their heads shake nearly all the time, like a person with the palsy.

We had often tried to rear the larvæ, but always failed until we discovered the cause. After they were full fed they would rove around the feed box, gnawing a little here and there, but refusing to pupate, and finally died.

A few years ago several larvæ were discovered on a lilac bush where we could watch them daily; when ready to pupate they left the leaves and went down the stalks until they found one that was dead and somewhat decayed; here they bored round holes of the same diameter as their bodies, they wadded the chips up into round balls about the size of B. shot, as they took them out, and then dropped them to the ground. The holes extended into the stalk horizontally about .25 of an inch, and then down about two inches; when finished it was a perfect woodpecker's hole in miniature. After the holes were made the larvæ entered them, but whether they backed in or went in head first was not observed. It is probable that the former method was adopted, as the holes were so small it is scarcely possible that they could have turned after entering. They covered the opening with a thin parchment like silk, very near the color of the bark on the stalk, so that the place was hardly observable; in a few days the change to pupa takes place, and the moth comes out the next spring. Any one wishing to rear the larva of this moth can readily do so by putting some partly decayed sticks of lilac into the breeding cage. When they are full fed they will make their holes in the sticks as readily as when at liberty.

CORRESPONDENCE.

EXPLANATION.

Dear Sir: In reference to an article by the Rev. Geo. W. Taylor, of Vancouver Island, in the December No. (1885) of the ENTOMOLOGIST, a few words in explanation of my connection with the matter seem to be in place.

In looking over the collection he sent me, in the usual way for identification, I noted several species new to me, and I believed new to science. This opinion was shared in by the Toronto Entomologists to whom I showed them. Being in correspondence with M. L'Abbe Provancher, and believing him to be the best American authority on Northern Hymenoptera, I mailed the lot to him, except about twenty species, about the identity of which there could be no doubt. In a short time the box was

returned with a list of identifications and an explanatory note, in which the species found to be new were mentioned, with a statement that descriptions would appear in an early number of the "Naturaliste." The temporary suspension of the periodical doubtless prevented this.

I do not now remember what information I gave as to the collector, but I see from M. L'Abbe's note above referred to that he knew I did not own them, and that I had to return them to Vancouver. And if I remember aright, the box and many of the specimens were labelled with Mr. Taylor's name.

At this time I was compiling a list of Canadian Hymenoptera on which I entered Mr. Taylor's species, those undescribed being credited to Provancher. This list was afterwards incorporated in a check list of Canadian insects published by the Natural History Society of Toronto, in the preface of which Mr. Taylor is credited with a valuable contribution.

Before returning the collection to Mr. Taylor, I submitted it to a meeting of the Natural History Society, with M. L'Abbe's identifications, and read a short paper on the group as compared with Ontario species. This paper I intended to enlarge and publish as soon as M. L'Abbe's descriptions were available. The publication of the list by Mr. Taylor took the matter out of my hands, and I considered I had nothing further to do with it. What material M. L'Abbe had for his descriptions I do not know—doubtless quite ample—but all the Vancouver Island specimens he ever had from me were those sent to me by Mr. Taylor.

W. BRÖDIE, Toronto, Ont.
ly

Dear Sir: In the CAN. ENT., xvii., p. 243, Mr. C. F. Goodhue describes the larva of *Hemileuca maia* Dru., and refers to the description of the larva in Morris' Synopsis as the only one known to him. The larva has been described and figured by Smith & Abbott, Ins. Ga., pl. 50, figuring the two forms; by Westwood, Ed. Dru., ii., 45; by Harris, Inj. Ins. (Flint Ed.), p. 397; by Morris, Syn., p. 221; by Lintner, 23 Ann. Rep. State Cab. Nat. Hist., 1869, p. 153, giving a very full history, and by Riley, 5th Mo. Rept., 127-133, giving the complete life history with figures of egg masses, larva and imago, and noting very fully all color variations of the larva. *Spiraea* seems a new food plant, but both oak and willow are well established as such.

JOHN B. SMITH, National Museum, Washington, D. C.

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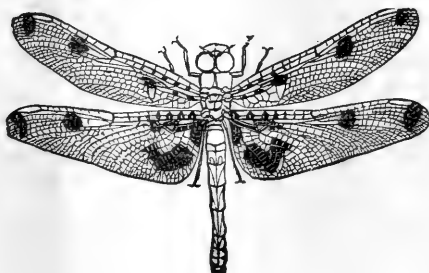
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VOL. XVIII.

LONDON, APRIL, 1886.

No. 4

DESCRIPTION OF NEW SPECIES OF BUTTERFLIES FOUND IN THE UNITED STATES.

BY W. H. EDWARDS, COALBURGH, W. VA.

I. ARGYNNIS SEMIRAMIS.

Male.—Expands about 2.3 inches.

Upper side bright fulvous, very little obscured at base; the black markings much as in *Adiante*, that is, slight on primaries, and still more so on secondaries, the spots on disk and to base being scarcely more than streaks.

Under side of primaries cinnamon-red at base and along inner margin to median, the upper two median interspaces more or less buff in middle; this red also crosses basal half of cell, and borders median to the arc; the remainder of cell and the discoidal and costal interspaces buff; a brown sub-apical patch, and hind margin brown; the sub-marginal crescents brown, and near apex lost in the ground color, from upper branch of median containing imperfectly silvered spots, the others without silver; the two spots on the patch well silvered.

Secondaries ferruginous-brown from base to second row of spots, mottled with a lighter shade; in some examples there is more of the light, the deepest color being in and above cell; the band between the two outer rows of spots quite clear, in color brownish buff; all the spots well silvered; those of marginal row long and narrow, of second row mostly large; so also of third row; all of these two rows edged slightly on basal side with black.

Body above concolored with wings, the thorax somewhat brown, beneath yellow-buff throughout; legs same, the upper sides reddish; palpi yellowish, red in front and at tip; antennæ black above, ferruginous below; club black, ferruginous at tip.

Female.—Expands about 3.7 inches.

Upper side nearly same color as in male, the markings of same character, sometimes almost obliterated on disks of secondaries. Under side

of primaries red over a large part of the wing, the upper outer corner only of cell being buff; the spots well silvered, the submarginal being usually limited to upper half the wing, as in the male, but examples occur in which silver is found down to lower median nervule.

Secondaries sometimes wholly fawn-color, except that the band has a tint only of yellow; in other examples the ground is darker, more brown, and the band is more distinct; all spots well silvered, those of the outer row sub-crescent and broad, of second row mostly large, and egg-shaped; the spots are closely as in *Coronis* and *Callippe*.

From San Bernardino, California, taken by Mr. W. G. Wright. I have seen upwards of 30 examples of this species, male and female, and the characters are very constant. It is curious how the markings resemble two such different species as *Adiante* (upper side) and *Coronis* (lower side).

2. ARGYNNIS CYPRIS.

Male.—Expands 2.8 to 3 inches; size of *Alcestis*, which it closely resembles. Upper side bright fulvous, scarcely at all obscured by brown at base; the black markings light; both wings bordered by a double line, the submarginal lunules touching it only at apex of primaries; the round spots small; the mesial band of secondaries represented by narrow and small crescents; the spot in cell more like figure 2 than letter S; fringes black at ends of nervules, yellowish in the interspaces.

Under side of primaries nearly all cinnamon-red, only the upper outer corner of cell and the interspaces next beyond being buff; apex and hind margin brown, the latter shading into the red of wing towards inner angle; the lower three or four submarginal spots sharply serrated, black, the rest same brown as the margin, and not defined; these last only enclosing spots which are imperfectly silvered; on the sub-apical patch three well silvered spots.

Under side of secondaries light ferruginous-brown from base to farther side the second row of spots, mottled a little with reddish buff; the margin and the shadows over the outer spots same brown; the band reddish buff, much encroached on by the brown ground on either side, after the manner of *Aphrodite*, and more or less sprinkled with brown scales; the spots rather small, and well-silvered; the marginal row sub-triangular, sometimes broad, sometimes quite narrow; the spots of second row mostly egg-shaped; and these as well as the next row are edged on basal side

rather heavily with black ; a little silver at the junctions of the nervures at base, and along the shoulder and inner margins ; a small spot in cell in black ring.

Body concolored with the wings, thorax somewhat brown ; beneath, abdomen yellow-buff, thorax same, but with many red hairs ; legs red on upper sides, yellowish below ; palpi yellowish within, red without and at tip ; antennæ black above, fulvous below ; club black, tip ferruginous.

Female.—Expands 2.8 to 3 inches.

Color less bright, over secondaries decidedly reddish next base and on disk, the bases much obscured ; the markings heavier ; the marginal lines on both wings more or less confluent, and on primaries making a broad and solid border ; the spots on secondaries as in the male, the mesial band being broken into a series of separated crescents.

Under side of primaries fiery-red, the outer corner of cell and next interspaces yellow-buff ; the silver spots limited to the upper half wing, the serrations below these sharp and black.

Secondaries deep ferruginous, mottled a little with reddish buff ; the band encroached on as in the male ; the spots scarcely larger, and all well-silvered.

Found from Arizona to Montana. Taken in Colorado in 1871 by Mr. Mead ; by Mr. Morrison, in his trips to So. Colorado and to Arizona ; by Mr. Nash and Mr. Bruce in Colorado. It seems to be an abundant species in the latter State. From the time I received examples from Mr. Mead this form was a puzzle to me. It looked a good deal like *Aphrodite*, but yet was considerably unlike the Atlantic *Aphrodite*. When *Alcestis* was separated, this Rocky Mountain form seemed still more like that, but was manifestly distinct from it. In 1884, I received eggs from Mr. Nash, Pueblo, Col., and the females that laid them. From these I bred the larvæ and got three imagos, one male and two females, in 1885. I had not felt sure before that this form of male belonged to these females. The larvæ of *Aphrodite* and *Alcestis* I am well acquainted with. Both are brown-black when mature, with no other colors than what is present at the base of the tubercles, yellow or orange. In the present species the larvæ showed marked differences from those mentioned before they were half grown, and the mature larva is quite another affair, largely yellow, mottled black and yellow. As I shall figure the species and these stages in Vol. 3, Butterflies N. A., now begun, I will not describe the preparatory stages here. This is the species by mistake spoken of as

Halcyone in my letter to Professor Lintner, printed in Ent. Amer., 1, p. 213. *Halcyone* does not belong to the *Aphrodite* sub-group, but to that of *Coronis*. The larvæ of *Aphrodite* and *Alcestis*, as well as of *Cybele* and *Idalia*, will all be figured in my Volume 3; and some other Argynids also for that matter.

3. MELITAEA WRIGHTII.

Male.—Expands 1.3 inch.

Upper side black, marked with fiery fulvous and ochre-yellow; primaries have nearly all the cell red, in the example under view, sprinkled along median and at outer end with black scales; the marginal spots from near apex to upper branch of median, four in number, are large, rounded, the lowest one elongated, red, and the interspaces before each are red between the two rows of yellow spots; these spots of the first, or outer row, are all small, one to each interspace, and cross the wing, almost parallel with hind margin, but somewhat sinuous; the second row crosses the wing beyond cell, is made up of large spots, the one of upper median interspace wanting; a large spot of same color at outer end of cell, and another below.

Secondaries black; a marginal series of large ochre-yellow rounded spots, a sub-marginal of small, and a third of elongated across the disk, besides four nearer base, all these ochre yellow; fringes black at ends of nervules, pale yellow in the interspaces.

Under side of primaries red, the yellow spots repeated and enlarged; the red marginal spots replaced by yellow, the one in upper median interspace wanting, and the ground there being red.

Secondaries black, nearly covered with ochre-yellow spots; the marginal series large, irregular in size, nearly all sub-quadrangular; above these a row of small, round, on the black ground; the discal series much longer than on upper side, and the last one is extended up inner margin almost to base; about base and in cell six spots cover nearly all the surface.

Body black, the rings of abdomen edged by yellow; under side yellow; legs red; palpi yellow, red without and at tip; antennæ black; club black, ferruginous at tip and beneath.

Female.—Expands 1.8 inch.

Similar to male, the apex largely red in all the interspaces, and the cell throughout; the spots on both wings, both red and yellow, larger.

Under side as in male, the yellow spots of submarginal row on secondaries more or less confluent with the marginal.

From 1 male, 1 female, sent me by Mr. W. G. Wright, taken at San Bernardino, flying with *Leanira*. Mr. Wright had in all 2 males and 2 females, the only examples observed by him. The species is nearest *Fulvia*, and is distinguished at once by its excess of red.

COLEOPTERA FOUND IN DEAD TRUNKS OF *TILIA AMERICANA* L., IN OCTOBER.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

Having examined a good number of dead trunks of the basswood or American linden,* *Tilia Americana* L., here this fall, I have found quite a list of Coleoptera in them either under the bark or in the decayed wood. The following is the list, which embraces thirty-four species taken from 13th October to 3rd November, 1885. Some of the species are only of accidental occurrence in the trunks, but will be readily known, and are given to record them from this locality. The determinations are mostly by Dr. Horn:—

Tachys nanus Gyll. Colonies or scattered individuals mixed with colonies of *Silvanus planatus* Germ., or by themselves, under the bark of the less decayed trunks.

Tachys flavicauda Say. One immature specimen by itself under the bark of a small decayed trunk, 17th October.

Pterostichus honestus Say. One or two specimens under some of the loose bark.

Platynus sinuatus Dej. Several under the same bark with the preceding.

Chlaenius circumcinctus Say. Remains of one specimen found under the bark of an upright decayed trunk out in the water, by the edge of the river.

* As a supplementary note to the trees of the main river district given in a previous article (CAN. ENTOM., XVII., p. 170), I would say that I omitted to mention the basswood, which is one of the most prominent trees of the rich woods along the St. Joseph River here, on account of its stately growth and straight, bare trunk, extending upward, smooth often for more than half its height. The button-wood or Western plane tree, called also sycamore, is of the same district.

Xantholinus cephalus Say. One under the bark.

Enchomus ventriculus Say. Taken singly under the bark.

Silvanus planatus Germ. Numerous colonies under the bark of the less decayed trunks.

Cucujus clavipes Fab. Four fine imagos taken 13th October, under the bark of a fallen trunk, one in an enclosure of borings formed on the inside surface of the bark, with pupal skin from which it had lately emerged beside it in the cell. On the inside of a strip of bark from another prostrate trunk, there were 18 or 20 of the empty cells in a continuous patch, where the beetles had transformed, six of these being in an exactly straight row, with their edges meeting in perfect regularity. Numbers of the larvæ under the bark of the trunks.

Læmophlæus pusillus Sch. One colony of about 25 individuals under the bark, 3rd November.

Brontes dubius Fab. Two specimens taken at different times under the bark, 13th and 15th October.

Hister vernus Say. A solitary specimen under the bark, 15th October.

Hister carolinus Payk. A solitary specimen under the bark, 3rd November.

Tenebrioides castanea Melsh. A number taken under the bark of a small, dry, decaying upright trunk, and an occasional specimen in other trunks.

Alaus oculatus Linn. Four of the beetles taken in the decaying wood of the trunks, and, 13th October, one pupa. Of the four imagos, three show inequality of the elytra, one considerably, the two others slightly.

Elater manipularis Cand. One specimen under the bark, 3rd November.

Melanotus communis Gyll. Under the bark.

Buprestidæ, larvæ of one species. A number of small, flat, big-headed borers taken 15th October boring between the bark and the wood of a rather sound trunk, one just beginning to decay, the bark being tight.

Cis chevrolatii Mellié. Two specimens taken 13th October, one on a small, hard kind of fungus growing out of the bark, the other under the bark.

Parandra brunnea Fab. Several dried specimens found under the

loose, dry bark where a fallen trunk had broken over, its base being suspended from the stump.

Cerambycidæ, larvæ of two species. Borers of uncertain genera, taken 15th October in same trunk with the *Buprestidæ* larvæ referred to above. A round, pinkish larva of moderate size, taken boring in the bark; and some larger and stouter larvæ, whitish or yellowish and round, boring first between the bark and wood, and afterward penetrating the wood and stopping up their passages with borings next the bark. Some larvæ very much like the latter, taken 3rd November in the decayed wood of another trunk.

Chrysomela elegans Oliv. Remains of one specimen, with the color well preserved, found under the bark.

Nyctobates pennsylvanica DeG. Common under the bark.

Scotobates calcaratus Fab. Remains (elytra and abdomen) of one specimen found in its cell, where it had transformed and died, in the decayed wood of an upright trunk in the water by the edge of the river.

Hoplocephala bicornis Oliv. Seven specimens altogether. One male under the bark, 13th October, one male in the decayed wood, 17th October, and three male and two female specimens under the bark, 3rd November. Of those taken the latter date, four were in company together. The specimen taken in the decayed wood was in a small cell or passage, and was found in such a manner as to indicate that it had fed on the wood.

Platydemia ruficornis Sturm. Nine specimens together under the bark at the base of an upright trunk, 13th October, and a company of fifteen under bark of a prostrate trunk, 15th October.

Tetratoma truncorum Lec. Four specimens, taken 13th October, under the loose, dry bark of the fallen trunk suspended at the base, and one, 17th October, in the decayed wood of a small, upright trunk. Two of those taken 13th October were *in coitu*, and remained joined after death in the alcohol bottle.

Penthe obliquata Fab. Two specimens taken at different times under the bark, 13th and 15th October.

Eustrophus bicolor Say. One solitary specimen taken 15th October, under the bark.

Orchesia castanea Melsh. Several taken under the loose, dry bark of a small upright trunk, 13th and 17th October.

Eupsalis minuta Drury. A single, apparently dead specimen, taken

3rd November in the decaying wood of a fallen trunk, where a piece had previously been broken out of it. It is likely to have been bred in the wood. Have taken numbers here under bark of dead oak.

Stenoscelis brevis Boh. Three specimens (one immature, being very light with only a slight tinge of color), taken 17th October in two small upright trunks, in their little cells in the dead and rotten wood, upon which they had without doubt fed in the larva state, and there changed afterward to perfect beetles.

Cratoparis lunatus Fab. Three specimens, two taken 13th October and one 17th October, in same trunks as preceding, under the loose bark but near some small holes in the wood, from which it is very probable they had lately emerged. I am inclined to the opinion that they had passed their larva state in the trunks, feeding on the decaying wood.

NOTES ON HYMENOPTERA, COLLECTED NEAR OTTAWA.

BY J. A. GUIGNARD, OTTAWA.

Within the first year of work in this branch of entomology in the Ottawa district, I was able to make acquaintance with all the 26 orders into which Hymenoptera are divided in Mr. Brodie's Canadian list; and now at the end of our second year, out of 247 genera, only about 70 remain unrepresented, while 13 genera are added not yet before met with in Canada, two of which have never been described.

I shall leave out the *Uroceridæ* and *Tenthredinidæ*, and not include them in the following figures, as Mr. W. H. Harrington has given especial attention to those two orders, and has already published an article on them.

As far as yet known, about 110 species new to Canada have been taken in this neighborhood, and more than half of them have been pronounced to be new to science by our high authority, Abbé Provancher, who has undertaken to describe them.

As to those already described, the Abbé, who has been so kind as to examine and identify them, has been greatly surprised at our possessing here many insects never before found in so high a latitude.

Order I. Among the *Apidæ* we have, for instance, obtained the red-girded *Bombus rufocinctus* Cress. We have also, however, *B. groenlandicus* Smith, which connects us with quite a different climate.

In the genus *Apathus*, we have a large new species, with black abdomen.

Order II. We raise the number of Canadian *Andrenidæ* from 120 to 125, a dozen being new species, one of a new genus close to *Stelis*; they are: 5 *Andrenæ*, 2 *Halicti*, 1 *Heriades*, 2 *Sphecodes*, besides another insect which Abbé Provancher has, on a first examination, placed among the *Anthophoræ*, but which, from its mouth-parts, seems to me to be nearer *Andrena*.

Of *Andrenidæ* described by Smith, we obtained:—

Andrena clypeata, male, yellow-faced, rather common, originally found in Florida.

A. fragilis, remarkable for its immensely long mandibles, and

A. victima.

Anthophora marginata?

Melissodes nigripes.

Megachile acuta, and the pretty little

Stelis fœderalis.

Of species named by Cresson, we possess:—

Halictus disparilis and *H. connexus*.

Andronicus cylindricus, whose male has very characteristic flattened and toothed antennæ.

Alcidamea pilosifrons—the antennæ of the male are also flattened, but end in a sharp hook. The females of the two species have ordinary clavate antennæ.

Orders III.; IV. *Vespidæ* and *Eumenidæ*. New species, none, as well as in the Orders VIII., *Bembecidæ*, X., *Sphegidæ*, and XXIV., *Evanidæ*.

Order V. *Crabronidæ*. Besides a new *Philanthus* obtained by Mr. Harrington, we add to the list:—

Oxybelus interruptus Cress., and *O. emarginatus* Say.,

Crabro chrysanginus St. Farg., *Cr. obscurus* Smith,

Cr. producticollis, Pack., and the diminutive

Stigmus pusillus Say.

Order VI. *Nyssonidæ*. Of this order of fine lively insects we add *Alyson melleus* Say, with yellow head and thorax, two new species of *Alyson*, which would both be easily mistaken for the male *Alyson oppositus* Say, and a very small *Nysson*, unspotted black.

Order VII. *Larridæ*. What I had taken for a *Nysson* has been recognized by Abbé Provancher to be a new species of *Lyroda*. I obtained

also a new *Larra*, very much like *L. terminata* Smith both in shape and color, but smaller.

To these two new species must be added the three following: *Larra argentata* Say, *L. lævifrons* Smith, and *L. arcuata* Smith.

Order IX. *Pompilidæ*. I caught this year

Agenia calcarata Cress., and two other species of the same genus, one pitch-black, of slender body, the other stout, with red abdomen, both new; A new *Pompilus*, with abdomen and femora tipped with white, And a ridiculously small, but most elegant *Ceropales*.

Order XI. *Scoliadidæ*. A fine little *Tiphia* seems to be *T. tarda* Say.

Order XII. *Mutillidæ*. Only one specimen has been met with belonging to this Order, a *Methoca*, found by Mr. Harrington.

Order XIII. *Formicidæ*. The only two genera of this Order noticed before in Canada were *Formica* and *Myrmica*; to the lists of their species must be added

Formica latipes? Walsh.

Myrmica opposita, Say, and

Myrmica lineolata Say.

Of other genera we have—

Solenopsis fugax Latr., only 1 millimetre long, common to Europe and America, caught in the Parliament's conservatory.

Ponera contracta Latr., moreover

4 new *Formica* have been found,

1 “ *Myrmica*,

1 “ *Lasius*,

1 “ *Leptothorax*, and

1 “ *Amblyopone*.

But before describing most of those new insects, Abbé Provancher wants the three sexes, which we do not yet possess. Of the last named he writes:—“It is a tropical genera, new to North America.” It is, therefore, a most extraordinary find.

Order XIV. *Chrysidæ*. Four species of *Chrysis* are new to the list,—of which one to science. The three before described are *Chrysis bella* Cress., *C. venusta* Cress. and *C. divergens* Cress.

Of the genus *Cleptes*, we have only one specimen, which belongs to an undescribed species.

There is to be added a new species of a genus not recorded before in

Canada, *Telenomus*. The last named a beautiful small insect of a shining black, while the *Cleptes* is rose-colored.

Order XV. *Chalcididæ*. This order of parasites and the next orders abound in more or less microscopical insects, some wingless, as found by Mr. Harrington in moss. We have sent only some of the larger ones to the Abbe' Provancher, who has identified

Smicra microgaster Say, and *Fteromalus vanessæ* Harr., besides referring other specimens to the genera *Callaspidia*, *Haltichella*, *Chalcis* and *Ormyrus*, all new to Canada except *Chalcis*.

Order XVI. *Cynipidæ*. Two new species have been captured by Mr. Harrington.

Rhodites bicolor Harr., and a very fine large *Halia*, of which the Abbe had been shown a specimen at St. Hyacinth, but wanting the abdomen.

Order XVII. *Proctotrupidæ*. This order gives us a new *Aneurynchus* and a new *Bathylus*.

Order XVIII. *Braconidæ*. Two new species—

Rogas parasiticus Nört., and

Chelonus lævifrons Cress. have been found, as well as seven new species—

One of *Syngaster*.

One of *Opius*.

One of *Microgaster*.

Two of *Microctonus*.

One of *Capitolinus*, a genus new to Canada, and lastly one of an undescribed genus of the tribe of the *Flexiliventres*.

Orders XIX. to XXIII. *Ichneumonidæ*. In the numerous species of this order I have very few new ones to record.

Lampronota lævigata Cress., and

Exetastes fuscipennis Cress., besides the following new species, undescribed :

One *Ichneumon*.

Three *Platylabus*.

Two *Phæogenes*.

Three *Phygadeuon*.

One *Hemiteles*.

Two *Limneria*.

One *Ephialtes*.

One *Theronia*.

One *Mesoleius*.

I regret not having time now to mention some interesting insects already on the list.

DESCRIPTION OF A SEEMINGLY RARE AND UNIQUE MOTH.

BY PH. FISCHER, BUFFALO, N. Y.

BROTIS VULNERARIA Hüb.

This moth appears to be the only one of its genus so far known in the United States.

Head small, yellowish red, almost hidden between the large and prominent eyes, which are naked ; palpi medium, slender, lighter colored ; thorax long, covered with long fine hair ; abdomen much shorter than the anal margin and Hesperid-shaped. Posterior wings elongated, costa straight, somewhat curved at apex, outer margin straight, inner margin somewhat rounded. On anterior wings the anal margin is longer than upper and outer margin, the latter being strongly rounded.

Color of entire insect a blackish brown, with three faint black lines running from inner margin to costa, on upper wings ; while there are only two on lower wing, running in a zigzag from anal to upper margin, and a single minute oval white dot within a black shading, between the two lines in equal distance from upper and anal margin. On the upper wings, nearer to apex and reaching costa, is a large triangular spot of a reddish-tinted light ochre-yellow. Antennæ long, yellow, pectinate, ending in a long thin spine. Under side, except palpi and upper tibiæ, silver grey. Size, $1\frac{3}{4}$ inches.

This interesting moth has been taken, with many other new and fine things (new in this locality), at the electric light near this city. At the first glance it resembles very much some large specimen of the darker Hesperidæ, and could easily be mistaken for one, if the strongly pectinate antennæ would not at once refer it to the Heterocera. The only figure of it has after a careful search been found in Hübner's "Zutrage," vol.

4, 2nd hundert, where the text reads thus: "From Bahia* ; Es ist blos, gewagt diese Gattung für eine Geometra ampla und Erastria abstracta zu nehmen," etc., which shows that this eminent author has even been in doubt where to place this specimen, as will be seen in the text accompanying the figure, and seems inclined to refer it to the Geometridæ.

Mr. Grote, in his last list, 1882, Heterocera of the United States, mentioned it and placed it as a separate Group after Hexeris, where I think it does not rightfully belong. It is entirely different in shape of head, thorax, abdomen and wings, from its neighbors ; and if a Noctuid, should be last, and just before Eupethecia. It also strongly reminds, but in shape and antennæ only, of *Amphidasys cupidaria* Gr., or *cognataria* Guen. Neither the genus nor the specimen is mentioned in the Brooklyn List. On Hübner's plate, in his vol. 4, Mr. Grote wrote under the figure thus: "Wisconsin (Hinsdale), Racine College, Wis.," without any further remarks, whether *B. vulneraria* has been found there, or only been seen by him in the collection of said College.

ON THE PROBABLE FOOD OF THE LARVA OF SCENOPINUS.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

Prof. F. W. Putnam communicated to me a larva of *Scenopinus* found in his house under a carpet. It belongs very probably to *Sc. pallipes* Say, which was reared by Mr. Sanborn out of larva found under a carpet. The larva is figured by Prof. A. S. Packard, Guide, p. 1 and 401, and Proc. Essex Just., October, 1867, p. 94, where three other larvae found under the carpet are mentioned. There are three European species reared. *Sc. senilis* (Bouché Naturg. Ins., p. 46) is said to live in rotten fungus on willows and other trees. *Sc. fenestralis* (Assman Stett. Ent. Z. 1863, p. 400) in over-ripe strawberries ; but it has been later suggested that it may belong to another species. Frauenfeld (Verh. Zool. Bot. Ges. Wien. 1864, vol. xiv) has reared *Sc. fenestralis* from larvae found in a horse hair mattress. Prof. Loew records the larvae living in a swallow's nest. Mr. Perris (Ann. Soc. Ent. Fr. 1870, vol. x., p. 230) tells that Dr.

* Bahia or San Salvador is a province of Brazil, about 600 miles north of Rio Janeiro.

Cartereau found in a swallow's nest a pupa of *Lucilia dispar* containing an imago of *Sc. fenestralis* which had not been able to leave the pupa of *Lucilia*, so the larva must have fed on it. Mr. Perris has found the pupa in wood holes made by *Hylotrapes bajulus*. He supposes the rotten fungi may have been attacked by Tineidæ or Coleopterous larvae, and that the larva of *Scenopinus* is carnivorous. Prof. F. W. Putnam found his larva near to an empty case of the cloth moth. Should it happen to be that the *Scenopinus* larva destroys those of the cloth moth? Then it would be a very beneficial insect. It would be very interesting to ascertain the fact by direct observation.

DESCRIPTIONS OF THREE NEW SPECIES OF GEOMETRIDÆ.

BY J. ELWYN BATES, SO. ABINGTON, MASS.

RHEUMAPTERA BRUNNEOMACULATA, sp. nov.

Abdomen and ground color of wings white. Head, thorax and antennæ cinereous. Inner third of fore wings containing three irregular ash-colored lines more heavily shaded towards the thorax. Mesial band crossed by two narrow, irregular and somewhat interrupted cinereous lines, between which on the inner margin of the wing is located a very distinct sub-triangular spot of deep brown color. Another larger, nearly quadrangular, very distinct brown patch, widest on costa, extends from costal margin to near the middle of the wing, in the lower part of which is located the oblong very dark brown discal dot.

The mesial band is limited exteriorly by a regularly scalloped cinereous line. A narrow sub-marginal irregularly scalloped white line shaded on both sides with brown scales; a darker patch filling two scallops above the middle and widening somewhat towards the outer margin of the wing.

A dark brown costo-apical patch about 0.04 of an inch broad, filling the space between the mesial band and the sub-marginal white line, beyond which is another small brown spot. Cilia on fore wings light brown. Hind wings with discal dot, and a strongly scalloped sub-marginal white line slightly sprinkled with brown scales, and heavily shaded interiorly with ash color.

Cilia nearly white dusted with brown scales at the terminus of the

veins. Beneath lighter ash-color with discal dots reproduced in both pairs of wings.

Expanse of wings one inch. Length of body 0.35; of fore-wings 0.45.

This fine species is described from one male captured in So. Abington, Mass., and is the only example that I have yet been able to find in ten years collecting.

It seems to be more nearly allied to *R. ruficillata*, Pack., than to any other species, yet is very different in size and markings.

SEMIOTHISA SEX-PUNCTATA,* sp. nov.

This species may perhaps be best described by a comparison with *S. granitata*, to which it seems closely allied, yet quite distinct. Antennæ simple. General color similar to many examples of *S. granitata*. Fore wings not excavated. The distinctive marks are four well defined, dark brown spots on the discal margin of the fore wings, which form the terminus of four pale ash-colored lines, while the extra discal line is rather broad, and contains two oblong parallel dark brown spots just above the middle of the wing. Discal dots barely apparent on both sides, but more distinct on hind wings. Beneath quite ochreous, but no more so than some varieties of *S. granitata*.

Expanse of wings 1.23 inches. Length of body —? (abdomen wanting).

Described from one female captured in Elko, Nev., at an elevation of about 10,000 feet.

PHASIANE CINEREATA, sp. nov.

Antennæ simple. Head, thorax and abdomen glaucous.

General color of wings above ash-gray; beneath approaching ochreous. A narrow brown line crosses the fore wings on the inner third, becoming nearly obsolete on the costa. The oblong discal ringlet centered with white. A faint brown line runs from the middle of the inner margin to the discal ringlet, but is very faint in this vicinity. An extra-discal narrow brown line crosses the wing, becoming obsolete on outer margin of hind wing, but reappearing near the middle and continu-

* Since writing the above, I have found a female example of *S. sex-punctata* that I had overlooked. The only difference from the one described is that the two small parallel brown spots in the centre of the extra-discal shading are in this example united into one spot.

ing to the inner margin. A sub-marginal somewhat diffuse brown band crosses both wings. A marginal row of triangular, intervenous, black dots. Fringe concolorous with the wings. Discal dot on hind wings brown, distinct. Veins beneath tawny and very distinct, between which the white and brown scales are nearly equally distributed, except that the brown predominates somewhat near the costa of the fore wings, and the white near the outer margin of hind wings. Discal dots dark brown, distinct. Legs concolorous with body and wings. Length of body 0.45; fore wing 0.58; expanse of wings 1.18 inches.

Judging from Mr. Packard's description of *P. neptata*, this species seems more nearly related to that form than any other.

Described from one female taken in Elko, Nevada.

NOTES ON ANT LIONS.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

As my former notes on the Ant Lions were of interest to some of your readers, perhaps a few additional particulars on the same subject may not be objectionable to them. Having had another opportunity of observing their habits, I made the best use I could of it. The abdomen of the nymph is somewhat heart-shaped, flat beneath and very much rounded above, thickest near the thorax, and sloping off suddenly to the sides and tail, which is an acute point. The thorax is long, and with the head is narrow and flat above, a form no doubt well adapted to its requirements. Its mode of travelling is backwards, always "advancing to the rear," one side contracted, which produces a circular movement, so that when one was placed in the centre of the palm of the hand, it made two rounds before it dropped over the side. As soon as it touched the sand it put itself instantly out of sight under the surface, where it lay for a short time perfectly quiet. When it began the formation of its pit, which I watched to its completion, it commenced by a jerk of the head and thorax, which threw the sand off and exposed them to view. It lowered them at once, made a sudden start back, when the sand covered them; then another jerk and another backward move rapidly executed, always throwing the sand to the outside. In its first round it described a circle of about an inch in diameter, reducing the circle with each round. A mound was

formed in the centre and the sand ran into the trench from both sides, and thus it worked away without a halt until the mound was all thrown out, and the pit had assumed the funnel shape, when it took a rest, after which it began throwing out the sand from the centre at its leisure, deepening and widening the pit very much. The time occupied in the first part of the operation may have been about half an hour.

One that I was watching, after it had made nearly a round in commencing a pit, seemed to be dissatisfied with the location, and started off on a prospecting tour to find one more to its liking. Its course was quite discernible by the disturbance of the surface sand, although it never appeared in view. In its travels it met an obstruction, a piece of broken pine limb about four inches long and an inch and a half in diameter, imbedded about an inch in the sand. Against this it struggled until it raised it out of its bed, moving one end along an inch and a half, when it was sufficiently elevated to permit the nymph to pass on without going below its ordinary depth. It had travelled hither and thither over a space of 12 or 14 inches without stopping, before I left it. It is most amusing to place one on its back and watch it get on its feet again. Although I am afraid the operation is quite indescribable by me, I can tell what it does not do; it does not spring up like an *Elatér*; it does not stretch out its legs as beetles generally do, they being very short, it could not nearly reach with its feet the surface on which it is laying; it does not seem merely to roll over, for when it has got on its feet it is in the identical spot it was when on its back. But while one is watching it attentively, it suddenly assumes that hazy, indefinite appearance that anything will when in rapid vibration, and when again distinctly seen it is resting quietly on its feet, but what it did more than vigorously shake itself, or how it accomplished the "presto change," I cannot say. I watched it again and again but could make nothing more of it.

The species to which these nymphs belonged would be either *abdominalis* or *obsoletus*, and they must have been nearing maturity, as some were out on the wing at the time. I took two *abdominalis*, one of them with a most unseemly length of abdomen, extending full three-fourths of an inch beyond the wings, which I take to be a female.

ABOUT CLEANING OILY SPECIMENS OF LEPIDOPTERA, ETC.

BY PH. FISCHER, BUFFALO, N. Y.

If a specimen becomes oily, it is generally believed that its beauty can never again be restored; but with a trifling cost and a little labor, any specimen will in a short time have again its former lustre, without injury to the insect. This remedy has been tried on the most tender Diurnals, as well as on Sphinges and Noctuids; it can be used on every insect. Should a specimen be oily throughout, body and wings, it may be put in the following fluid: One part of sulphuric ether to two parts of the strongest alcohol, and left therein for about 24 hours. Should the specimen be very oily, another bath may have to be applied. Should this second bath, after removing the insect, be only slightly discolored, the insect may be put in the last bath, which consists of pure sulphuric ether, in which it is left a few hours only. After being taken out and partly dried, it is put on the spreading board. Another way of cleaning specimens, where only the wings are oily, is this: The specimen is put on the spreading board, under side up, without fastening it in any way, and the purest spirits of turpentine poured on it to fully soak the wings, after which finely-powdered pipe clay is strewn thickly over the affected parts, and this left to dry. Should the clay, after being dry, be yellow, the oil is not all out of the wings, and the above has to be renewed. Should the clay be perfectly white after drying, it can be relied upon that every particle of the fatty matter is drawn out of the wings. To remove the clay it needs a little experience, though any one can do it with a little care. Hold your specimen on the upper part of the pin, and give the pin a little jerk near the point, and the clay, being brittle, will easily fall off. After it is all removed, the specimen may be brushed off with a fine camel hair brush until clean. A specimen treated in the above ways will never again become oily.

CORRESPONDENCE.

Dear Sir: Whilst out for an entomological ramble at Lachine on Nov. 11th last, I took a fine specimen of *Dicerca obscura* Fab. at the foot of a tree, but whether the tree was an oak or a maple I unfortunately did not at the time note. Now this is very interesting, as it seems to indicate that this species, too, is double-brooded. I have read of some of the

Calcephoræ being captured late in the autumn, but never of *D. obscura*. Does it also hibernate? Perhaps some one that has a better knowledge of the habits of this species than I, may be able to give us an additional record of experience. The beetle, by the way, is rather a rarity in the vicinage of Montreal.

J. F. HANSEN, Montreal.

OECANTHUS.

Dear Sir: Referring to the genus *Oecanthus*, I have only been able to find in the works of several authors *O. niveus* as damaging fruit, etc. I have taken *O. niveus* entirely about apple and hard wood; *O. fasciatus* Fitch about raspberries, etc., and certain woody weeds. They are more common than *niveus* here, and very distinct.

E. W. ALLIS, Adrian, Mich.

ON THE FULMINATING PROPERTY IN CALATHUS GREGRAIUS SAY.

While collecting in the woods, 9th November, 1884, I rolled over an old rotten log and discovered a number of reddish-brown Carabs, with lighter legs and antennæ, which proved to be *Calathus gregarius*, Say. These I captured and put in a cyanide bottle. Looking at the bottle soon afterward, I noticed that it was filled with a white smoke, which, I soon saw, was emitted by the Carabs. This somewhat surprised me, as up to that time I had never heard of this peculiarity occurring in any other genus than *Brachynus*. Since then I have seen a notice of its having been observed in *Metrius* by Mr. Ricksecker (*Eutomolog. Amer.*, vol. I., p. 98). I should be glad to know if it has been noticed in *Calathus* by any other collectors.

C. H. T. TOWNSEND, Constantine, Mich.

Dear Sir: I have just become acquainted with the fact that a fine specimen of *Erebus odora* has been caught (in August, 1884) at the mouth of Eighteen-mile Creek, a few miles south of Buffalo, N. Y., by Mr. E. M. Chamot, of this city, at sugaring. The insect must evidently have been bred here, as it is not rubbed at all, only somewhat torn, and may not have been on the wing more than one night. It measures about five inches from tip to tip.

PH. FISCHER, Buffalo, N. Y.

Dear Sir: In connection with the article entitled "The Colias Controversy," by Mr. R. H. Stretch (CAN. ENT., vol. 18, p. 54-56), I would like to call attention to the fact that early in the year 1884, Mr. Stretch wrote Mr. W. H. Edwards that he knew nothing about the "purposely prepared" Colias (cf. *Papilio*, vol. 4, p. 170), but that on the 9th of December, 1885, he requires about two and a half pages of printed matter "to state in a concise manner" what he knows about it. Mr. Stretch quotes from his note-book, "*July 4th*,* took very fine series of Colias (3 forms)," and adds, "it" (the specimen under discussion) "might have been either one of these or some other." The "purposely prepared" Colias was taken at Umatala, June 25, so that we can all agree that it was "some other." Under the circumstances, I am unable to hold in high esteem Mr. Stretch's assertion that I have stated "the case exactly," or allow that he is able to add any *facts* to "The Colias Controversy."

SAML. HENSHAW.

OUT EARLY.

Dear Sir: *Belostoma Americanum*, the "Electric Light Bug," as it is popularly called here, and its usual companion, *Dytiscus marginalis*, the "Water Tiger," were out abundantly this evening at the electric lamps, as last summer. The toads also put in an appearance at the same time and place as they were accustomed to do last year.

E. W. CLAYPOLE.

Akron, O., March 18, 1886.

INSTANCE OF RETARDED DEVELOPMENT, AUG. 11TH, 1883, CASSIA, FLA.

Dear Sir: About June 15th, I collected nine chrysalids of *Papilio cressphontes* from orange trees. They were newly made. From June 22nd to June 27th all but one gave imagines; this, on subsequent examination, was found to be alive, and (Aug. 11th) gave also its imago, a large ♀, thus being retarded in development about 45 days—the conditions of environment being the same for all.

J. ELWYN BATES, So. Abington, Mass.

* The italics mine.

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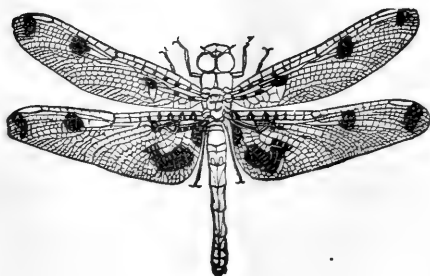
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LONDON, MAY, 1886.

No. 5

MONOGRAPH OF THE LOMATINA OF NORTH AMERICA.

BY D. W. COQUILLET, ANAHEIM, CAL.

The Lomatina may easily be distinguished from the other Bombylidæ by the following characters :

Front very large ; antennæ shorter than the head, the third joint at least twice as long as the first, tapering to the tip, or suddenly contracted near its base, the terminal portion styliform ; terminal style minute. Proboscis never projecting more than one half its length beyond the hyperstoma. Front and face when viewed from the side form a gentle curve, never greatly produced at base of antennæ. Wings with two submarginal and four posterior cells ; furcation of the second and third veins occurs before the small cross-vein at a distance of at least twice the length of that cross-vein. All of the tibiae bristly.

The following table contains all the genera known to occur in North America :

- | | |
|--|-------------------------|
| 1.—Third basal cell open..... | 2 |
| Third basal cell closed, third antennal joint when viewed from the side more than twice as long as wide, gradually tapering from near base to apex, which is blunt and bears a very short, sharp-pointed style ; pulvilli present..... | |
| 2.—Third antennal joint when viewed from the side, more than twice as long as wide, suddenly contracted near its base, the terminal portion styliform ; whole of face pilose..... | 3 |
| Third antennal joint when viewed from the side, but little longer than wide ; upper half of face bare ; pulvilli present.... | |
| 3.—Pulvilli present ; face usually retreating below..... | 3. <i>Aphæbantus</i> . |
| Pulvilli wanting ; face projecting below..... | 2. <i>Leptochilus</i> . |

Stygia elongata Say does not belong to the Lomatina.

Triodites O. S. = *Aphæbantus* Lw. At the time of establishing this genus, the Baron Osten Sacken had not seen a specimen of *Aphæbantus*

(see West. Dipt., p. 228), and the only character he gives for separating these two genera (l. c., p. 229) is that the second submarginal cell is appendiculate in *Aphobantus*, and not appendiculate in *Triodites*, but this character frequently varies in different specimens of the same species, and sometimes even in the different wings of the same specimen. The species upon which these two genera were established (*T. mus* O. S., and *A. cervinus* Lw.) do not offer any characters that would justify their separation into two different genera.

In the following pages I have placed an exclamation point (!) after those localities from which I have obtained specimens of the species.

I. EUCESSIA, n. gen.

Antennæ porrect, third joint when viewed from the side scarcely longer than wide, somewhat oval in outline, but tapering to the tip, which is blunt and bears a very short style, tipped with a short bristle; first joint longer than the second, but not one half as long as the third; first two joints of nearly an equal width, not much more than one half as wide as the third at its base. Face retreating below, bare except on oral margin. Head a little thicker than long, wider than the thorax, and fully three fourths as large. Thorax with bristles in front of wings and on hind angles. Scutellum rounded behind. Wings with two submarginal and four posterior cells, all of the latter open, as is also the third basal; small cross-vein near middle of discal cell; furcation of second and third veins occurs before proximal end of discal cell. All of the tibiae provided with bristles; pulvilli pad-like.

Eucessia rubens, n. sp.—♀. Front black, the lower half white pollinose, reddish or white pilose; face densely silvery-white pollinose, the upper part bare, oral margin white and reddish pilose; proboscis not projecting beyond hyperstoma. Antennal joints proportioned as 2, 1 and 6; first two joints reddish, the third black. Occiput white tomentose, that in middle above, reddish. Thorax black, reddish tomentose, the bristles also reddish; pleura white pilose. Scutellum reddish, above black, its tomentum and bristles reddish. Abdomen reddish, tomentum concolorous except a white vittae on middle of dorsum and one on each side; pile of first segment white, dense on the sides, that on sides of other segments sparse, reddish; venter reddish, its tomentum concolorous. Legs reddish, tomentum concolorous, that on hind side of each femur and

on front side of hind femora at base, white ; bristles reddish ; apex of tarsi black. Wings hyaline, costal cell yellowish.

♂. Eyes quite widely separated on the front, the latter wholly silvery white pollinose ; hypopygium very large and greatly dilated below.

Length 4-5 m.m. Cal. ! 4 ♂ and 6 ♀, in Sept. (several pairs were in coitu).

2. LEPTOCHILUS, Loew.

1.—Hind margin of scutellum shallowly concave, wings hyaline, costal cell yellowish.....*modestus* Lw.

Hind margin of scutellum convex, basal third or more of wings blackish-brown.....*transitus*, n. sp.

L. transitus, n. sp.—♀. Front black, the lower half gray pollinose, black pilose, that next the antennae white ; face black, gray pollinose, yellowish and black pilose, most abundant on oral margin ; face and front apparently destitute of short, appressed tomentum ; proboscis never projects more than one half the length of its labellæ beyond hyperstoma. Antennæ black, first joint about four times as long as the second. Occiput gray pollinose, the upper part yellowish tomentose. Thorax black, yellowish tomentose, sides broadly white tomentose ; pile and bristles largely black ; pleura white pilose, that on upper part yellowish. Scutellum shining black, rounded behind, yellowish tomentose, the pile and bristles black. Abdomen black, yellowish tomentose, that on base of each segment white ; sides of first segment abundant whitish pilose, sides of other segments very sparse black and white pilose, dorsum of abdomen sparse long black pilose ; venter black, white tomentose. Femora black, tibiae, bases of tarsi and sometimes of the femora, reddish ; apex of tarsi and sometimes base of hind tarsi and apex of hind tibiae, black ; tomentum of legs white, the bristles reddish. Wings hyaline at the apex, the base brown, the outline of this color extending from apex of first vein obliquely to second vein, then basally a short distance, then transversely to discal cell beyond small cross-vein, then basally to base of discal cell, then transversely to extreme base of fourth posterior cell, then basally to axillary incision.

♂. Eyes narrowly separated on the front, hypopygium small and not dilated below.

Length 5-8 m. m. Cal. ! 10 ♂ and 7 ♀ in April.

L. modestus Loew.—♀. Differs from *transitus* as follows: Front whitish tomentose, and black and yellowish pilose; face whitish tomentose, oral margin yellowish pilose; proboscis projects about one fourth its length beyond hyperstoma; first two joints of antennæ yellowish pilose. Occiput whitish tomentose, that in middle above reddish. Thorax mixed whitish and yellow tomentose, more whitish in front and each side; pile reddish and black, longest behind; bristles reddish; pleura white pilose. Scutellum shallowly concave behind, mixed white and yellow tomentose, pile and bristles reddish. Abdomen largely reddish, tomentose, that on base and sides whitish; pile white and yellowish; venter mixed white and yellowish tomentose. Tomentum of legs mixed white and yellowish. Wings hyaline, costal cell yellowish.

♂. Hypopygium rather large, and considerably dilated below.

Length, 7–10 m. m. Cal. ! Texas. 5 ♂ and 5 ♀ in April and May.

3. APHÆBANTUS LOEW. (Syn. *Triodites* O. S.)

1.—Thorax and abdomen destitute of white-tomentose dorsal vittæ....2

Thorax with two, abdomen with one white-tomentose dorsal

vitta.....*vittatus* n. sp.

2.—Proboscis never projects more than the length of its labellæ beyond the hyperstoma.....3

Proboscis projects half its length beyond the hyperstoma...*litus*, n. sp.

3.—Abdomen black tomentose and with white-tomentose cross bands.....*mus* O. S.

Abdomen yellowish tomentose, destitute of distinct white-

tomentose cross bands.....4

4.—Abdomen densely clothed with long, erect, whitish pile; abdomen of male depressed, about as wide as the thorax, in outline elongate-ellipsoidal.....*hirsutus*, n. sp.

Abdomen never densely clothed with long erect pile, abdomen of male usually sub-cylindrical and tapering posteriorly.*cervinus* Lw.

Aphæbantus litus, n. sp.—♀. Front black, the lower half gray pollinose, mixed yellowish and white tomentose and black pilose; face black, destitute of tomentum, densely gray pollinose except on lower edge, sparse white and yellowish pilose, most abundant in middle below; oral margin white and yellowish; proboscis projects about half its length beyond hyperstoma. Antennæ black, first joint nearly twice as long as the second, and about as long as the thickened basal part of third; styliform portion

of third joint very slender, and about three times as long as the thickened basal part of this joint. Occiput gray pollinose, white tomentose, the upper part largely yellowish tomentose. Thorax black, mixed white and yellowish tomentose, the pile and bristles largely black; pleura white pilose and tomentose. Scutellum shining black, rounded behind, yellowish tomentose, the pile and bristles black. Abdomen black, mixed black, brown and whitish tomentose, the black forming a cross band at base of the second segment, the brown chiefly confined to base of each segment; first segment wholly white tomentose and pilose, pile of other segments very sparse, white; venter black, whitish tomentose. Femora and apices of tarsi black, tips of femora, tibiae wholly and bases of tarsi, reddish; tomentum of legs white, the bristles reddish. Wings hyaline, costal cell yellowish; a stump of a vein near base of anterior branch of third vein.

♂. Eyes barely contiguous on the front, the latter wholly gray pollinose and yellowish pilose, abdomen with black-tomentose cross bands at base of each segment, tarsi wholly reddish; hypopygium moderate, slightly dilated below, its upper half behind long black or reddish pilose.

Length 7-10 m. m. Cal. ! 3 ♂ and 1 ♀ in Sept. The face is less retreating below than in the other species.

Aphæbantus hirsutus, n. sp.—Wholly black. Front yellowish tomentose and black pilose, face yellowish white tomentose and pilose; proboscis projects half the length of its labellæ beyond hyperstoma. Antennal joints as 2, 1 and 4, the styliform portion of the third joint about twice as long as the thickened basal part of this joint. Occiput white tomentose. Thorax yellowish tomentose and pilose; pleura white pilose. Pile and bristles of scutellum pale yellowish. Abdomen yellowish tomentose and densely clothed with long white or yellowish pile; venter white pilose. Legs white tomentose, the bristles reddish. Wings hyaline, the costal cell yellowish.

♂. Eyes very narrowly separated on the front; abdomen greatly depressed, about as wide as the thorax, elongate-ellipsoidal in outline; hypopygium very small; front and middle tibiae with a row of white pile on the outside.

Length 7-8 m. m. Cal. ! 2 ♂ and 2 ♀.

Aphæbantus mus O. S. (Syn. *Triodites mus* O. S.)—Female. Black, the tibiae and tarsi sometimes reddish. Front gray pollinose on lower part, whitish tomentose and black pilose; face gray pollinose and whitish

pilose ; proboscis not projecting beyond hyperstoma ; styliform portion of third joint of antennae about twice as long as the thickened basal part of this joint. Occiput white tomentose. Thorax yellowish tomentose, more whitish on the sides, the bristles black or yellowish. Scutellum rounded behind, yellowish tomentose, the pile and bristles black. Abdomen black tomentose and with a white-tomentose cross band on apex of each segment except the last one ; first segment wholly white and yellowish pilose ; sides of abdomen quite abundant long white pilose ; venter white tomentose. Legs white tomentose, the bristles reddish. Wings hyaline, the sub-costal cell yellowish.

Male.—Eyes meet each other for some distance on the front.

Length 4-8 m. m. Cal. ! Ariz. ! Utah. 4 males and 7 females.

Aphæbantus vittatus, n. sp.—Female. Black, tips of femora, tibiae and tarsi reddish. Front and face white tomentose and pilose, tomentum of front sometimes largely or wholly brownish ; proboscis not projecting beyond hyperstoma. Styliform portion of third joint of antennae about once and a fourth as long as the thickened basal part of this joint ; second joint minute. Occiput white tomentose. Thorax brownish tomentose, and with two widely separated white-tomentose dorsal vittae ; sides of thorax and pleura white tomentose, bristles of thorax reddish. Scutellum mixed white and brown tomentose, its hind margin wholly white tomentose, the bristles black. Abdomen brown tomentose, a dorsal vitta, the sides and venter white tomentose. Legs white tomentose, the bristles reddish. Wings hyaline, the costal cell yellowish.

Male.—Eyes quite widely separated on the front, hypopygium moderate and not noticeably dilated below.

Length 4-6 m. m. Cal. ! 5 males and 5 females.

Aphæbantus cervinus Loew.—Differs from *vittatus* only in having no white-tomentose vittae on the thorax and abdomen, the sides of the thoracic dorsum and of the abdomen are not so conspicuously white tomentose, and the eyes of the male meet each other for some distance on the front. Pile of front varies from white, through yellowish, to black, and the tomentum of front varies from white to brown ; bristles of thorax, scutellum and tibiae usually reddish, but sometimes black.

Length 6-11 m. m. Cal. ! Ariz. ! Col. ! Texas. 15 male and 11 females, July to Oct.

Var. *pavidus* n. var.—Differs from the typical *cervinus* in being smaller, and in having the front and face densely snow-white tomentose, but the front is sometimes brownish tomentose. Length 4-6 m. m. Cal. ! 1 male and 4 females.

4. ONCODOCERA Macq.

1.—Length 4-7 m. m.; first posterior cell open.....*leucoprocta*

Length 14 m. m.; first posterior cell closed.....*valida*

Oncodocera leucoprocta Wied. (Syn. *Mulio leucoprocta* Wied.; *Anthrax terminalis* Wied.; *Oncodocera dimidiata* Macq.)—Male. Wholly black, the thorax, scutellum and abdomen deep velvet-black. Wholly black pilose except front, face and last two abdominal segments, which are white pilose, but thorax sometimes largely yellowish pilose, and pile on sides of abdomen sometimes rusty-brownish. Apex of wings hyaline, the base brownish, the outline of this color extending from apex of first vein obliquely to base of fourth posterior cell, then following penultimate vein to hind margin of wing; axillary cell almost wholly hyaline; apex of first basal cell hyaline; only the extreme base of discal cell brown. Eyes contiguous for some distance; proboscis not projecting beyond hyperstoma.

Female.—Pile of head and body, except sides of abdomen, yellowish; no white pile on last two abdominal segments.

Length 4-7 m. m. N. C. ! Va., Ill., Wis., Ky., Ga., Fla. ! Mex.

Oncodocera valida Wied. (Syn. *Anthrax valida* Wied.; *Anisotamia eximia* Macq.)—As I have never seen a specimen of this species, I give below a translation of Wiedemann's original description (Aus. Zwei. Ins., II., page 636).

"Deep black, abdomen having the apex each side fulvous pilose, in the male with two vittæ; 7 lines. From Oaxaca in Mexico.

"Antennæ black, with a simple style. Eyes of the ♂ contiguous, so that on the crown only a small space remains, extended in a point anteriorly. Besides these, the whole insect is black, and black pilose, only the end of the abdomen with golden-yellow, beneath even foxy-reddish, glossy, silken pile, which in the male forms two broad vittæ that extend to the first segment, but in the female only forming two spots which extend across the last two segments. Wings on the costal margin for two-thirds their length brownish; in the male less dark. Veins as in the fifth tribe, except that the inner branch of the forked vein is connected with the next following vein at the hind margin of the wing."

DESCRIPTION OF THE PREPARATORY STAGES OF
SATYRUS CHARON, EDW.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Conoidal, somewhat rounded at base ; truncated, nearly flat, a very little convex, at top ; the sides a little convex, and marked by about twenty-two sharp vertical ridges, which start from edge of base and end at rim of summit, the spaces between these ridges deeply and roundly excavated ; the summit is covered with shallow cells, irregularly five and six-sided, in four rows, not concentric, but somewhat spiral, about a central rosette of rhomboids. Very like the egg of *Alope*, but there are a greater number of flutings on sides. Color lemon-yellow. Duration of this stage about 12 days.

YOUNG LARVA.—Length .1 inch ; the anterior segments thickest, tapering from 3 or 4 to 13, at the extremity nearly square, with a projecting point at either side ; armed with long white processes or bristles, arranged as follows : on either side, a sub-dorsal row, a second on mid-side, and a third along base ; also two demi-rows confined to 2, 3, 4, one of them between the two upper rows, the other between the second and third rows ; the sub-dorsal has one bristle each on 2, 3, 4, bent forward, 2 each from 5 to 12, 1 on 13, besides another proceeding from the terminal point, all bent back ; the demi and lateral rows have one to each segment, all bent forward, except those on 12, 13 ; the lower row has two to each segment, those on 2 bent forward slightly, all the rest back ; these bristles are thick at base and taper a little to a blunt point, and under a high power are seen to be rough with the stubs of branching spurs ; there are also over pro- and anal legs two shorter bristles to each ; in most of these bristles the bend is close to base, giving them the appearance of so many hooks ; and they spring from rather prominent tubercles ; color of body pinkish-yellow, with red-brown longitudinal lines, one mid-dorsal, two finer ones close together on mid-side, and another heavier than the last just over spiracles ; there is also a less distinct and broken line along base ; legs and pro-legs color of body ; head one-half broader than 2, sub-globose, narrowing upwards, the top a little depressed ; color yellow-brown, specked thickly with red-brown ; a few white bristles over surface, like those on body and rising from dark brown tubercles, all bent down ; ocelli brown, except the largest, which is emerald-green.

About eight days after beginning to feed the larva changed color, becoming pale green, the lines as before, head as before. From end of hibernation to first moult 21 to 38 days, the larvæ being on grass in a warm room.

After First Moult.—Length at 24 hours after the moult, .15 inch; tapering from anterior segments to 13 both dorsally and laterally, the last ones a little arched; 13 ends in two conical tails, one at either side, the space between roundly excavated; body covered with rough tuberculations, from which come short stiff processes, not tapering, but small at base, and thick at end and rounded, varying in size and somewhat in length; rough also like the bristles at first stage; except on 2, where these are turned forward, all are bent back and flattened to the body, which gives a downy coating to whole surface; color green; a pale brown mid-dorsal line, two such on middle of side and another over spiracles; feet green, whitish at ends, pro-legs green; head a little broader than 2, sub-globose, bright green, pitted with darker green, rough with white tubercles, each of which gives a process like those on body, and bent down; ocelli emerald. Duration of this stage 15 to 20 days.

After Second Moult.—Length at 24 hours, .3 inch; same shape; color either yellow-green or a bluish sage-green; covered with bent processes as before; the lines as before, but green instead of brown; along base a yellow stripe; head as before. Duration of this stage 12 to 18 days.

After Third Moult.—Length at 20 hours, .4 inch; color yellow-green; tails reddish; the mid-dorsal stripe distinct, the three side lines not well defined; the basal ridge yellow; there is also now a sub-dorsal line or narrow stripe of pale yellow. Duration of this stage 15 to 20 days.

After Fourth Moult.—Length at 18 hours .54 inch; closely as in last previous stage; 5 days later was fully grown.

MATURE LARVA.—Length .94 inch, greatest breadth .12 inch; cylindrical, tapering from middle to end both on dorsum and sides, rather stout in middle, but not obese, the anterior segments even; ends in two sharp conical divergent tails; each segment creased six times, and on the flattened ridges so caused are numerous fine yellowish tubercles, each of which sends out a short, slender, white process, more or less pressed to the surface; color yellow-green over dorsum to sub-dorsal band, from that to base more green, less yellow; the tails pale red, on outer sides

yellow ; the sub-dorsal band nearly as wide as basal, and same shade of yellow ; the dorsal stripe is dark green, and is edged on either side narrowly by yellow ; feet and legs green ; head sub-globose, broad at base, narrowing upwards, a little depressed at top ; roughly tuberculated, the tubercles in vertical rows, conical, each with white hair ; color bright green ; the ocelli brown, except the largest, which is emerald. Duration of this stage 20 days at the least.

CHRYSLIS.—Length, male .4 inch, female .5 to .54 inch ; breadth across mesonotum, male .16, female .17 ; across abdomen, male .17, female .18 inch ; cylindrical, abdomen conical ; head case short, narrow at top and a little convex, the sides excavated ; mesonotum prominent, roundly carinated, the sides somewhat convex, followed by a shallow depression ; color pale yellow-green, the dorsal side throughout, and the ventral side of abdomen, thickly dotted and mottled with whitish ; three whitish stripes along dorsum, one in middle, the others sub-dorsal, and running from end to end ; on the wing cases are three streaks of darker green, the longest in mid-wing and reaching hind margin, the others short and stopping before margin ; there are also some small patches same green ; wing cases next base, the top of head case and keel of mesonotum lined with white.

Another example was wholly whitish-green, no dark streaks on wing cases and no dorsal bands.

Others were greenish-black, finely dotted gray ; the three dorsal stripes gray ; the wings black and gray, about equally, running in streaks with the nervules.

Another was of a dull brown, with no tinge of green, marked like the last described, but the light parts were of a pinkish-white ; on the wings were three deep black streaks, corresponding to the green ones before mentioned. Duration of this stage 11 to 12 days.

This pretty little *Satyrus* was first made known by Mr. T. L. Mead, who took it in Colorado in 1871. It was described by me in Trans. Am. Ent. Soc., iv., p. 69, 1872, and appended was a note as follows : " This species was first met near the Twin Lakes, in Upper Arkansas Valley, elevation 8,000 feet, in July, 1871. It flew near the ground, frequently alighting on the sage-brush, and seemed much more partial to flowers than was *Satyrus* (*Hipparchia*) *Ridingsii*, also common in that vicinity. By the latter part of July it was abundant throughout the entire Park and

mountain country, and so continued till September." In Mr. Mead's Report on the Lepidoptera taken by the Wheeler Expeditions, 1875, it was farther said of *Charon*: "It was found both in South and Middle Parks, though not so abundantly as in the Arkansas Valley. In August, females were obtained and inclosed with grass; several eggs were laid; they are whitish and very similar to those of *Nephele*." I do not know that another line has been published on the habits of this butterfly than what Mr. Mead wrote or authorized as above, although the species has been taken in many localities from New Mexico to Montana, and even in British America, as appears by Captain Geddes' list. Mr. Morrison also took it in Nevada.

I received 20 eggs of *Charon* from Mr. H. W. Nash, then at Rosita, Colorado, 4th August, 1884; on the 10th August, 23 more, and many others on 14th Aug.; sent through the mail, in turned wooden boxes, the eggs all obtained by confining females in bags over grass. They came in perfect order, and began to hatch, the 1st lot, 10th Aug., the 2nd lot, 17th. The larvæ were remarkably like those of *Alope*, same shape, color, longitudinal bands and processes, and the latter were bent like fish-hooks, just as in *Alope*. I had larvæ of *Hipparchia Ridingsii* hatching at same time, and the difference between them and the larvæ of *Charon* at this stage was striking. It was generic. The same resemblance to *Alope* runs through the whole history of *Charon*, egg, all the larval stages, and the chrysalis, except that in color this last is variable as to coloration in *Charon*, and not in *Alope*.

The larvæ devoured the egg shells more or less completely, but eat no grass, and settled themselves for a winter's sleep. I left them for several weeks in the cellar, in paper pill boxes. On 10th October, they were sent to Clifton Springs, New York, and placed in the "cooler" of the Sanitarium there, temp. all the year 40° Far. On 7th March, 1885, I received the larvæ again; nearly all were alive, and they were placed on a sod of grass set in flower pot, and covered by a glass lamp chimney. On 8th, several were feeding. The first larva passed 1st moult 29th March, but several were ready to pass this moult for about a week had the weather been pleasant, instead of cold, cloudy and stormy, much of the time. Two more passed the moult 2nd April. The last one of 15 larvæ passed 1st moult 15th April; so that between the first and last was an interval of 17 days.

The second moult began on 9th April, and the last one of 10 larvæ passed same 21st April, a difference of 12 days.

The third moult began 21st April, and the last of 8 larvæ passed same 7th May, a difference of 15 days.

The fourth moult began 3rd May, and the last of 9 larvæ passed same 6th June, a difference of 34 days.

The first chrysalis formed 20th May, and the last larva was mature 10th June, and would have pupated about 15th, had I not put it in alcohol. The difference would have been about 26 days in pupating.

The first imago out of chrysalis was on 2nd June, the pupa period being from 11 to 12 days.

So that, supposing larvae to behave in natural condition as these in confinement, fresh butterflies from same brood would be coming out daily for several weeks. And so undoubtedly they do, as is the case with *Alope*.

LARVA OF COELODASYS MUSTELINA, PACK.

BY G. H. FRENCH, CARBONDALE, ILL.

Length .80 of an inch. Head oblique, narrow, slightly bilobed, about one-fourth of the head above the height of joint 2; body nearly cylindrical; on joint 5 a nearly conical projection about two-thirds as high as the depth of the body, bifid at the top, each part tipped with a hair; on joint 9 is a slight elevation, and a more prominent one on joint 12. When at rest the posterior part of the body is raised, making these elevations appear more prominent. In color, the head, joint 2, and the dorsum of joints 3 and 4 to the top of the tubercle on joint 5, is dark brownish purple mottled with gray, the sides being lighter than the front of the head and the dorsum, the latter narrow posteriorly; the sides of joints 3 and 4 are bright green with a few fine purple dots and a pale dorsal edging; the sides of the body back of joint 4 are a series of fine, close, crenate purplish red lines or mottlings on a grayish yellow ground color, more yellow above, giving the sides something of an orange appearance; the dorsum of joints 5 to 8 is more of a grayish color from the ground color being paler and the mottlings finer and more of a purple shade; a darker patch on the dorsum of joint 8, this color extending

back obliquely on joints 9 and 10, making a dark purple lateral line ; the pale part of the dorsum is wider on the posterior than on the anterior of each joint, the space being bordered by an oblique purple line that fades out before quite reaching the lateral line ; the rest of the dorsum is like the sides, except a little darker ; between the two posterior tubercles or elevations is a clear white V, the point beginning on the anterior part of joint 10 and extending back to the posterior part of joint 11 on the sides.

Three of these larvæ were found by Mrs. French on a rose bush, September 18, 1884, nearly grown. By October 1st they had pupated, fastening the leaves together for a puparium, within which they changed. The following spring these produced three imagines, May 20, 22 and 31 respectively. No effort was made to rear a second brood, but from the time the larvæ were found in the fall it is to be presumed that there are two broods in a season.

NOTES ON CERTAIN COLEOPTERA OF THE NEIGHBORHOOD OF GALESBURG, ILL.

BY C. W. STRUMBERG.

Lebia divisa Lec.—Twenty-nine specimens of this beautiful Carabid were taken during July (1884) with the sweeping net, on various weeds along the edge of a slough. One specimen was found under a board. Towards sunset seemed to be the only time they could be captured, differing in that respect from some of the others of the genus, which are about at all hours of the day. My first specimen was taken in 1876 in same locality.

Lebia tricolor, *pleuritica* and *analisa* seem to be rare. Have taken them with the sieve late in October.

Apenes sinuata Say. Oct., two specimens under a log.

Pentagonica bicolor Lec. Not rare among leaves and rubbish in the late fall and early spring. Specimens are often taken in the sweeping net during summer.

Cryptobium serpentinum Lec. Oct. 2 (1883?). Took two specimens of this fine insect under logs in moist woods.

Dicerca asperata L. & G. Was found in numbers late in the fall by searching among the fallen leaves on hill sides, especially in flat places or

depressions near large trees. Sometimes a specimen of *D. lepida* was taken, while *D. divaricata* and *D. obscura* were quite common.

Stethon pectorosus Léc. July, two specimens under bark.

Fornax badius Melsh. July 18th, 16 specimens under the bark of a stump.

CELIPTERA BIFASCIATA, SP. NOV.

BY J. ELWYN BATES, SO. ABINGTON, MASS.

Coloration and shading as in *frustulum*, with the following exceptions, which are very marked and leave no room for doubt that it is entirely distinct from that species.

The peculiar black spots on the inner third of the fore wings of *frustulum*, are entirely wanting in this species. There is a small dark brown triangular spot acutely pointed and situated very near the costa, in line with the extra-discal row of dots, and ending on costa and outer margin of the wings. In some specimens these spots are rounded internally. A light buff-colored band crosses the wings, limiting the inner third, which is shaded heavily with chocolate-brown exteriorly. This band is nearly identical in coloration with the extra-discal one, though perhaps a trifle lighter. In *frustulum* the extra-discal band bends outward beyond the median vein, while in this species it pursues an unaltered course to the costa. Discal ringlet somewhat reniform, and smaller than in *frustulum*. Traces of two very faint brown lines crossing the fore wings in discal space, nearly parallel with the extra-discal band. A light cinereous narrow band crosses the hind wings from the inner angle to a point in line with the extra-discal band of the fore wings. Wings quite heavily shaded with brown beyond this band. No other markings on hind wings. Beneath like *frustulum*, except that it is of a darker hue. Length of fore wing, male, .70, female, .73; of body, male, .65, female, .70; expanse of wings, male, 1.50, female, 1.56 inches.

This insect is rather common at Cassia, Orange Co., Fla., where I took a number of specimens. It flies by daylight as well as by night, and is one of a very small number of species that will come to sugar in that locality.

I sent specimens of this insect to several entomologists for deter-

mination, and one returned it under the name of *C. frustulum*, and the others said it was new to them. It does not compare with any examples of *frustulum* that I have seen, and I therefore venture to describe it as a new species.

NOTE ON STATEN ISLAND NOCTUIDÆ.

BY A. R. GROTE, A. M.

My earliest collecting field was the south side of Staten Island, where I found many rare insects, especially among the Coleoptera. This south beach of the Island is visited by the warm spring coming from the south very early in the year, and is a good collecting field. Staten Island is a continuation of the Jersey coast, and one finds on it southern species of butterflies such as *Argynnis Idalia*, which are less frequent on Long Island, the next extension of the coast to the north. So far as the fauna is concerned, I am inclined to class Staten Island with New Jersey, rather than with New York. It forms the beautiful southern boundary of New York Harbor. At the same time Mr. Davis informs us that the Red Squirrel, not uncommon on the mainland of New Jersey, is not found on Staten Island, and thus has not crossed the narrow Kills. But I have abundant faith it will yet turn up on the Island, where all good things naturally live. I have collected on Staten Island a good many of those kinds of moths which come up our coast with the warmer weather and the Gulf Stream. I have in various papers called attention to the seasonal migration, from south to north, of many species of moths, which adds so much to the fauna of the United States. These moths have found a lodgment in Florida, but probably do not breed to the northward. I have taken on Staten Island *Euthisanotia Timais*, the Spanish Moth, as also *Aletia Argillacea*, the Cotton Worm. So far as I know, the northern limit of successful hibernation of the latter is not yet definitely ascertained, notwithstanding all that has been published by the U. S. Government on the subject. Also in the fall I have taken *Anomis Erosa* Hübn., a Noctuid allied to the Cotton Worm, although in the cut of wing and color it resembles *Eucirroedia Pampinatrix* Guen., a Noctuid which has, I believe, real affinities with *Scoliopteryx Libatrix*, a Noctuid found in North America and Europe. This latter inhabits Canada and Hudson's Bay

Territory. It has not been introduced, but is apparently an unchanged survival since before the Glacial Epoch, when the fauna of Siberia, northern Europe and boreal America had much in common.

Mr. Davis has given me some common Staten Island *Noctuidæ*, and it is strange that these few species should have among their number at least two southern visitants which probably do not hibernate successfully on Staten Island. I hope local lists will soon be published by the Staten Island Natural Science Association, and the following may serve as a slight introduction thereto :

- Apatela occidentalis* G. & R. July 30.
Agrotis saucia Hübn. Oct. 15.
 " *clandestina* Harris. June 24.
Mamestra trifolii Rott. Aug. 15.
 " *renigera* Steph. June 8.
Hadena devastatrix Brace. Aug. 15.
 " *dubitans* Walk. "
Prodenia flavimedia Harvey. Aug. 9.
Laphygma frugiperda Abb. & Sm. Aug. and Oct.
Autumnalis Riley.
Orthosia ferrugineoides Guen. Oct. 15.
Anomis erosa Hübn. Oct. 20.
Aletia argillacea Hübn. Oct. 7.
Eucirroedia pampina Guen. Sept. 2.
Pyrria exprimens Walk. July 22.
Lýgranthoecia marginata Haw. July and Aug.
Plusia precatationis Guen. July 22.
Syneda graphica Hübn. May 15.

Among the southern visitants I once took a specimen of the strange Noctuid, *Sylectra Erycata* Cram., on the Battery, New York City. Its home is, I believe, Surinam ; it had certainly wandered far. The Blue and Green Sphinx, *Arges Labruscæ* Linn., has been taken in New Jersey. This species probably does not breed within the limits of the United States, although since Mr. Thaxter has bred *Euthisanotia Timais* in southern Florida, we may expect that the Florida Colony of tropical Lepidoptera embraces many West Indian moths.

A NEW CHALCID PARASITE ON THE COMMON BASKET WORM (*Thyridopteryx ephemeraeformis* Haworth).

BY WM. H. ASHMEAD, JACKSONVILLE, FLORIDA.

This peculiar moth, which so perplexed the older Lepidopterists at classifying, is quite common in Florida on oaks, willows, shrubs, etc.

Full accounts of its habits, with accurate figures of the moth, caterpillar, etc., will be found in Prof. Riley's "First Mo. Report," Saunders' "Insects Injurious to Fruits," and Dr. Lintner's "First N. Y. Report."

Indeed, these authors quite fully, accurately and succinctly describe the habits and parasites of this pest, and it would not now be noticed by me but for the fact of my breeding from it here in Florida a Chalcid parasite new to science and unnoticed by any of the above mentioned authors.

Prof. Riley, in his report, gave but two parasites, *Pimpla inquisitor* Say, and *Hemiteles thyridopterygis* Riley. Mr. Lintner, in his work, added *Pimpla conquisitor* Say, *Chalcis ovata* Say, a *Pteromalus* allied to *Pteromalus puparum* L., and a fly—*Tachina* species—making in all six parasites.

I have now the pleasure of recording the seventh, a *species novum*, interesting from the fact that it belongs to a genus in the family *Chalcididae*, recognized by the abnormal shape of its first antennal joint, and in which heretofore but one species was known to science, and that described from Europe.

Sub-fam. EUCYRTINÆ.

Dinocarsis thyridopterygis, n. sp.

♀. Length .06; wing exp. .14 inch. Color: pale brown, abdomen darker; posterior femora and tibiae darker; scutellum rather large, somewhat orange.

Head much broader than thorax, eyes large, brown; antennae long, 11-jointed, large, strongly, sub-triangularly keeled below, the three terminal joints white; wings rather long and narrow, pubescent, submarginal vein short, rather close to and parallel with outer margin, marginal vein not extending to half the length of wing, it, with stigmal and postmarginal veins, very small and about equal in length.

Described from a specimen bred in March.

The rearing of this Chalcid is quite interesting, as it is the first of the genus recorded from North America, and the second species known.

The genus *Dinocarsis* was erected by Forster in 1856, *vide* Hymenopterologische Studien, p. 33, to contain *Eucyrtus hemipterus* Dalman.

Dr. Mayr, in Die Europäischen Eucyrtiden, gives the synonymy as follows :

Dinocarsis hemiptera Dalm.

Eucyrtus hemipterus Dalm., Ict. Ac. H. 1820, p. 166 (42) und 371.

Nees Hym. i. a. M., 1834, p. 252.

Dinocarsis hemiptera Forst., Hym. Stud. ii., 1856, p. 37.

Dicelloceras vibrans Six Tijdschr. v. Entomol. 1867, pl. x., f. g.

Nothing is known of this European species. Mine, while bred from the case, is evidently parasitic on the eggs enclosed therein.

NOTE ON PRIONOXYSTUS ROBINIÆ.

BY AUG. R. GROTE, A. M.

Having recently examined the European *Cossus* (*Xyleutes*) *ligniperda*, the generic differences between *Cossus* and *Prionoxystus* impressed me quite forcibly. The *Cossidæ* or *Teredines* of Hübner (Grote, Proc. Am. Phil. Soc., Nov., 1874), form a sub-family group of the "Spinners" or *Bombycidæ*, and are generally characterized by the wood-eating habit of the larvæ, which are provided with powerful mandibles for the purpose. The moths are generally of a clumsy build and are usually of a gray color, resembling the bark of trees on which they rest, and are more or less reticulated with darker shade lines, peppered and spotted so as to give the idea of protective imitation. The ocelli are wanting and the tongue is rudimentary. In the genus *Cossus*, and in most of the genera of the group, the vestiture of the body is close, thick and hairy. Although gray is the prevailing color, some Australian species have the hind wings especially of a reddish-brown hue. The European *Zeuzera Aesculi* is white, spotted over wings and thorax with steely blue. The North American genus *Prionoxystus* differs at first sight by the sparse, thinly laid on, scaly vestiture. The thorax, compared with *Cossus*, is elongated and the prothorax slopes to the head, which latter is freer than in *Cossus*. This gives the insect a Sphingid appearance which, joined to the more pointed wings and the yellow secondaries of the male, recalls certain *Macroglossinæ*, notably our *Lepisesia flavofasciata*. The parts of the head afford comparative differences when examined and compared with *Cossus*.

The chitinous tegument of the body appears readily, when the mealy vestiture is rubbed and is black and stout. The wings are very papery and a worn *Robinia*, as it sits on a locust or other tree, reminds one a little of some of the larger wood eating *Cerambycidae*, such as the *Prionians*. The European *Cossus* is very sluggish in its habits, whereas *Prionoxystus* is, when first hatched, comparatively an active insect, flying readily when disturbed. We have two species in our fauna which I refer to *Prionoxystus*, viz., *Robinia* Peck, the type of the genus (found from East to West apparently), and *Querciperda* of Fitch, which I believe is only Eastern and of much rarer occurrence. With *Prionoxystus*, we have a true *Cossus*, the *Centerensis* of Lintner, beside several other species of this Fabrician genus, judging from Authors. We have also three species, Western, of the genus *Hypochocha*, and then the small-sized and singular *Cossula magnifica* of Bailey, from Florida. I have never recognized the "*Zeuzera Canadensis*," figured by Herrich-Schaeffer, and it seems to me that the moth is wrongly referred and the probability is that we have no true North American species of *Zeuzera*. But it may be that the European *Aesculi* has been introduced into the United States. Twice the description of a moth was communicated to me which might have been this species. Nothing is easier than the transportation of wood-eating larvæ or pupæ. There are three European species of *Cossus*, and the larva of one of them, *Terebra*, is said to remain four years in poplar wood before pupating.

ON PLAGIOMIMICUS RICHII.

BY A. R. GROTE, A. M.

This species I have mistaken, according to Mr. J. B. Smith, for *Polenta Tepperi* in several of my papers. The moth is easily recognized, being of a delicate green color and having the transverse lines similar to *Plagiomimicus Pityochromus*, which is a blackish fuscous and stouter species. *P. Richii* has the anterior tibiæ armed with a claw and the clypeus provided with a cup-like expansion, less prominent than in *Pityochromus*. *P. Richii* occurs in Texas, Florida, and I have seen it also from the Southwest. The genus may be further known by the tips of the patagia being somewhat relieved, and belongs to the *Stiriina*, a group of *Noctuidæ* which I have fully discussed in the pages of the CANADIAN ENTOMOLOGIST. I regret that I have been mistaken in my identification

of *Polenta*, thus needlessly criticizing Mr. Morrison and afterwards Mr. J. B. Smith. But my first specimen of *P. Richii* (see Bull. Buf. Soc. Nat. Sci.) was given to me as authentically determined, and I was confirmed in my belief by seeing the type of *Polenta* afterwards, which curiously resembled my species, though not so brightly colored; I, however, could not examine its structure, which is now stated by Mr. Smith to be quite different from my species, *P. Richii*, inasmuch as the anterior tibiæ are said to be unarmed. I hope to be able to figure our two species of *Plagiomimicus* ere long, the genus being very interesting to me from its casual resemblance to *Lygranthoezia*, though structurally so different.

BOOK NOTICE.

Systematic Review of Fossil Myriopods, Arachnoids and Insects: By Samuel H. Scudder.

This work, separately printed in German out of the "Handbuch der Palæontologie," Leipzig, 1885, is a most welcome one to the student who was obliged to look for information as to its subject in a quantity of different publications. The text is remarkably clear and concise, and woodcuts illustrating the different genera give all possible information on the difficult subject. That so many existing families of insects were represented in the Miocene is remarkable. The beetles, owing to their hard forms and sharp outlines, are the best preserved and the most recognizable. Even a *Stylops* has been found in Prussian amber, which belongs to a genus which may be called *Mengea* after its discoverer, the term *Triaena* being used for a sub-genus of *Apatela* called by Guenée afterwards *Semaphora*, and which is not unlikely to come into use as a distinct generic term. The Lepidoptera are very sparingly represented in the Tertiary, but the larger groups all existed. An interesting figure of the fossil butterfly, *Prodryas Persephone* Scudd., is given from the Oligocene of Florissant, Colorado, where the beds have proved prolific in insect remains. Even a caterpillar (Provence) has come up to us out of these abysses of time.

This brief notice of a work which will add enduringly to Mr. Scudder's reputation, will be sufficient to call the attention of the readers of the CANADIAN ENTOMOLOGIST to its publication, and is all that is here designed. The book itself will repay study, and it is hoped that it will also appear (as it doubtless also exists) in English.

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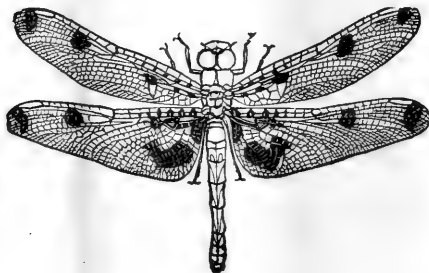
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SOME NOTES UPON THE SPHINGIDÆ OF THE UNITED STATES.

BY REV. W. J. HOLLAND, PITTSBURGH, PA.

I am indebted to my esteemed correspondent, Prof. C. H. Fernald, for a copy of his recent Synopsis of the Sphingidæ of New England. I have been greatly pleased with it, and trust that it will meet with that general distribution among the students of our beautiful science which it deserves. In the following lines I wish to present a few observations which the perusal of Prof. Fernald's book suggests.

Hemaris Tenuis, Grote.

Prof. Fernald remarks of this species: "The early stages and food plants are unknown." Presuming that the statement of the learned Professor is warranted by an exhaustive search through the literature of the subject, I shall venture to supply from my own observation what strikes me as a surprising deficiency, since *Hemaris Tenuis* is one of our most abundant species in Western Pennsylvania.

The food plant is the Snow-berry, *Symphoricarpus racemosus*, and I took last fall from one bush of this plant over twenty larvæ. My breeding cages this morning (April 26th) are full of the perfect insects, which, having just emerged from chrysalis, and lost none of the scales which at this stage cover the pellucid parts of the wings, are all of the form "*fumosa*" described by Strecker (Lepidoptera Rhopal. and Heteroceres, pp. 93, 140). Flown specimens, which abound at the lilacs in the grounds near by, are without the "smoky" appearance which led our Reading savant to apply the name, and show themselves unmistakably as "clear-wings."

Larva and Chrysalis.—A part of each larval brood is light apple-green in color; a part is reddish brown. This phenomenon is often apparent in the larvæ of the Sphingidæ, and is manifestly not due to the influence of the food plant, as both varieties are found side by side upon

the same plant. The pro-legs and the ventral aspect of the larva are in all cases chocolate brown throughout, deepening almost to black in the reddish brown portion of the brood spoken of above. The legs proper are jet black. The head is round and only partially retractile. The edge of the fleshy fold of the first segment immediately behind the head is minutely granulated with bright yellow. The spiracles are marked by small black spots enclosing two minute white points. The caudal horn is curved forward, and is covered with minute spiny processes. It is black at the tip, the black color extending downward before and behind to the junction with the body, but on either side at the base the horn is bright yellow, gradually fading into the green of the surrounding cuticle.

The larva spins a moderately compact cocoon among dried leaves at the surface of the ground. The silk is deep brown in color. The chrysalis is from seven eighths to nine eighths of an inch in length, smooth, long in proportion to its diameter, tapering to a fine point in the cremaster, and dull black in color.

Hemaris Thysbe, var. *uniformis*, G. & R.

This form is common at Pittsburgh, and prevails altogether at Cresson, Pa., on the summit of the Allegheny Mountains. I have never found it in West Virginia, North Carolina, and Southern Indiana, where I have collected extensively. I have never received it from any of numerous correspondents and collectors south of the Potomac and the lower Ohio. Prof. Fernald tells us that this variety is "common at Orono." May it not be regarded as a peculiarly *northern form*?

Amphion Nessus, Cram.

I have taken this species on several occasions at light, and it flies most commonly at dusk in these latitudes. If found flying in the middle of the day, I have noticed that it always keeps in the shadow, or slyly hovers about among the thick masses of the *Syringa* blossoms, in the deep umbrageous recesses, where it is not easily reached by the net of the collector.

Daremma Undulosa, Walker.

The larva of this species feeds occasionally upon the white oak and the red oak.

Sphinx Orcodaphne, H. Edw.

I have a specimen of this insect, taken by Mr. James Behrens, and

kindly determined by Mr. H. Edwards, which I am altogether unable to distinguish from small specimens of *Sphinx Chersis* taken in the vicinity of Pittsburgh, at Orono, Me., and various other localities in the United States. The Brooklyn Check List in making *Oreodaphne* a variety of *Chersis*, hardly goes far enough. It seems to me there can be no harm done to science by making *Oreodaphne* a synonym for *Chersis*.

Sphinx Vancouverensis, H. Edw.

I have a specimen of this form, bred by Mr. Behrens and determined by Mr. H. Edwards. It is a male. If taken in Allegheny County it would be unhesitatingly pronounced to be *Sphinx Drupiferarum*, Ab. & S. Mr. Grote, in his Check List of 1882, gives *Vashti*, Strecker, as a synonym for *Vancouverensis*. A comparison of Strecker's figure in Lep., Rhopal. & Heteroceres, pl. xv., fig. 4, with the specimen before me, indicates considerable difference. In my mind it is very doubtful whether *Vashti* is correctly regarded as a synonym for *Vancouverensis*, while it seems clear to me that *Vancouverensis* is a synonym for *Drupiferarum*, if my specimen determined by the author of the species is an index.

Dolba Hylaeus, Drury.

This moth is exceedingly common in Southern Indiana, where the larva feeds on the *Asimina triloba*, or Pawpaw. I have taken as many as ten larvæ from a small Pawpaw bush.

Dilophonota Ello, Linn. The description of the preliminary stages of this species given by Prof. Fernald is evidently founded upon Boisduval, who derives it from a figure given by Madame Merian on the sixty-first plate of her work, which Boisduval supposes was intended to represent the larva of *Ello*. The description is exceedingly defective, and in the interest of more exact knowledge I shall venture to give one founded upon a series of beautifully prepared larvæ obtained from my valued correspondent, Dr. Wittfeld, who accompanied the specimens with a number of interesting MS. notes.

Egg.—"Dark green; deposited on the under side of the leaves of the food plant, which is *Euphorbia heterophylla*." (Wittfeld).

Larva.—The larva presents again the phenomenon of dimorphism, or rather of dichromatism, alluded to in the foregoing note upon *H. Tenuis*. A part of each larval brood is green from the time of the first moult, and a part remains of a purplish brown color, the color of the newly hatched larvæ.

Green Variety.—The head is round and marked on either side by a dark brown line running from the insertion of the palpi to the vertex, and continuing along the dorsal aspect of each segment, gradually diverging until the fourth segment, then continuing parallel until they suddenly converge at the base of the caudal horn. These dark lines are bordered externally by light yellow, shading off into the darker green of the sides and ventral surface of the larva. The space upon the back of the larva enclosed by these lines is delicately sprinkled with dark brown and light yellow spots, the ground color being apple-green, save in the three anterior segments. These segments are of a light olive green between the lines, and are ornamented by a median line of dark brown or black, running from the vertex of the head to the third segment, where it is lost in a large circular black spot, margined externally by bright yellow, outside of which on either side is a shade of deep reddish brown, of a lunular form. The sides of the larva are faintly mottled in the same manner as the back and are further ornamented by small white blotches, disposed one upon each segment just posterior to its junction with the preceding segment, and on a line with the spiracles.

The legs are yellow, annulated with black, the prolegs are black, bordered at their juncture with the segments with yellow, and having the circlet also yellow. The caudal horn is very short and blunt, and distinctly four angled. In one specimen it is almost obsolete.

Brown Variety.—The brown variety does not differ from the green save in color, and the consequent obscuration of the dark lines and markings, which appear less distinct upon the darker ground, and the heightening of the effect of the light spots which come out into bold relief upon the darker surface.

The mature larva is from three to three and a half inches in length and about one-half of an inch in diameter.

The larva pupates near the surface under fallen leaves. The pupa is dark brown. The imago emerges in from fourteen to fifteen days.

The insect is very common in Eastern Florida. I have specimens also from the Antilles, Central America, Trinidad, and Brazil.

Everyx Versicolor, Harris.

The larva of this beautiful moth is found in Western Pennsylvania upon the wild Hydrangea, *Hydrangea arborescens*, which abounds in the deep ravines near streams of running water. The larvæ are either green

or pinkish brown, the brown ones being as numerous as the green. They are peculiarly liable to the attack of parasites, and out of nearly fifty specimens secured in 1884, only nine or ten came to maturity as perfect moths. The rest fell a prey to a species of *Pezomachus*.

Triptogon Occidentalis, Hy. Edwards.

This is a western variety of *T. Modesta*, Harr., differing from the type-form simply in being generally larger in size and paler in color. *Modesta* is found in Western Pennsylvania, Ohio, and Southern Indiana. The examples of *Modesta* from S. Indiana are hardly to be distinguished from specimens of *Occidentalis* from Colorado.

Cressonia Juglandis, Ab. & S.

The larva of this species is commonly found in Western Pennsylvania and Southern Indiana.

PREPARATORY STAGES OF TETRACIS TRIANGULIFERATA, PACK.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Elongate or oval, .03 of an inch long by .025 of an inch wide, ribbed longitudinally like a muskmelon by about 15 ribs; color pale yellowish green: Duration of this period 8 days.

Young Larva.—Length .10 of an inch; cylindrical, with 10 legs; grayish white, without marks except a bright scarlet transverse line across the posterior part of joint 2, jaws the same color, legs concolorous, the six thoracic slightly pink tinted. Duration of this period 6 to 7 days.

After First Moulting.—Length .30 of an inch; shape as before; dorsum dark purplish gray, paler in some; on each side a row of five short streaks, slightly lunate, bordered outside with paler, those at the incisures between the joints pale, on each side of joints 8 and 9 a blackish purple patch, the first the largest; venter with one pale and two dark stripes and some spots; head as before. Some examples have the dorsum pale green with a gray shading. Duration of this period 5 days.

After Second Moulting.—Length .50 of an inch; cylindrical, near the posterior part of each of joints 6 to 10 are four slight elevations in a

transverse row, those on joint 8 tubercular, the rest small, color vandyke brown, each supporting a minute hair. Color brown, pale on the dorsum of all the joints but 5 and 6, but dark back of the elevations; the sides of the joints from 8 back with more or less vandyke brown patches situated on each side of a dorsal line of dark brown; traces of a stigmatal and subdorsal whitish line; general color of sides and venter yellowish brown, the latter with two broken vandyke brown lines; head brownish, of a honey cast. There is not so much difference in shade as during the former period, traces of subdorsal white lines. Seventeen days after this moult the larvæ began to spin leaves together for their cocoons, without my noting whether they moulted once or twice more.

Mature Larva.—Length 1.50 inches; width of head .06 inch, of middle of joint 7, .10 inch, of posterior part of joint 7 over row of tubercles .16 inch, the width of enlarged portion of succeeding joints .14 inch. Slender, tapering slightly from the head back; head rather flat, the posterior part not higher than the anterior part of joint 2; joint 7 enlarged near its posterior part, where it bears four tubercles; joint 8 enlarged posteriorly, but the tubercles are very small; on joint 9 the two dorsal tubercles a little larger; tubercles on joints 10 and 11 scarcely perceptible, but the two dorsal tubercles on joint 12 prominent. Color yellowish brown, in some places amounting to brownish yellow, marked with umber and blackish or vandyke brown. Head and joint 2 slightly reddish brown; joint 3 yellowish brown with a dorsal brown V on its posterior part; joints 4, 5 and 6 of a little darker shade, the V not so distinct and followed by a brown patch that coalesces with it, more or less of a distinct subdorsal whitish streak; joint 7 with an oblong brown patch back of each dorsal tubercle, a vandyke brown patch on each side mottled with yellowish; within this patch is situated the lateral tubercle; joints 9 and 10 the same as 7, the vandyke brown extending down on the legs; some vandyke brown on joint 11; there is a sub-obsolete dorsal dark line, and all the joints are more or less mottled with brown. Venter with rather distinct stripes, the central one pale, all formed by a mottling of yellowish white and dark, the dark part lighter on the pale stripe than on the others, the white forming an irregular line on each side of this.

Chrysalis.—Length .65 inch, wing and antennæ cases .40 inch, reaching to posterior part of joint 5, cylindrical; depth through joint 1, .15 inch, through joint 4, .18 inch, through joint 5, .17 inch, from this tapering to crenaster; not depressed on joint 1, but gradually tapering from

joint 4 forward, and from this point more rapidly backward; head rounded; tongue and antennæ case extending a little further back than the wing cases. Color pale yellowish brown, faintly mottled with dark reddish brown; a double dorsal row, a pair to each joint, of dark brown patches; a lateral row of the same at the edge of the wing cases on joints 2 to 5; a single ventral row from joint 6 back, and smaller patches scattered over the ventral surface. The wing, tongue and antennæ cases are darker, the ground color slightly darker and the mottlings thicker, so as to be nearly uniform dark purplish brown. Duration of this period from 249 to 282 days.

The eggs producing the larvæ from which this description was taken were obtained from Mr. C. F. McGlashan, Truckee, Cal. The eggs were deposited June 19, 1885, hatching June 25. They began to spin leaves together July 21st, the imagines, three in number, being produced March 27th, April 18th and 29th, 1886, respectively, giving pupal periods of 249, 271 and 282 days, or giving 286, 308 and 319 days from the time the eggs were deposited to the perfect insects. There is a possibility that in this latitude there would be a second brood with a short pupal period, but probably in its home in the Sierras the imagines are produced much later than here, and that there is only one brood.

While in confinement they ate Missouri or Golden Currant (*Ribes Aureum*). In pupating a few leaves were fastened together within which was a button of silk to which the crenaster was fastened.

NOTE ON CERTAIN SPECIES OF THE GENUS ARCTIA.

BY A. R. GRÖTE, A. M., BREMEN, GERMANY.

It is only comparatively recently that I have seen the article of Mr. B. Neumoegen upon the genus *Arctia* and its variations, contained in *Papilio*, vol. 3, p. 148. So far as my own experience and conclusions go, I am, except in two instances which I notice here, generally agreed with the views of this writer. Especially am I of opinion that recently there has been an unscientific and unsound attempt to class as one species

forms of Lepidoptera quite different in appearance, upon insufficient evidence. I have formerly pointed out that Entomologists are naturally divided into two camps: the "lumpers" and the "splitters." For my part I do not at all object to present species being thrown together as varieties, *provided the evidence is complete that they are inter-dependent forms*. What I object to is the hasty manner in which the most of the *lumping* is accomplished in some recent articles, such as Dr. Hagen's on *Papilio* and Mr. Hulst's on *Arctia*. Really if this sort of thing is to go on, we had better stop studying species altogether, considering all the various forms belonging to any one genus as mere varieties of each other, and dispense with naming them. But, since progress is indisputable in all matters, I fancy that in most cases this lumping mania is only the result of the discovery of the extreme variability of certain species and the jumping at the conclusion that it is so with certain other species as to which the necessary proof is as yet wanting. Certain forms described as species of *Arctia* are shown to be varieties, and Mr. Hulst is not satisfied but that *A. Persephone* must be a yellow *A. Virgo* or *A. Saundersii*. It has been one of the beliefs of the Brooklyn Entomologists that *Persephone* was a var. of *Virgo*, because my old friend Mr. Graef had a *Virgo* with yellow secondaries in his collection. The two cases in which I disagree with Mr. Neumoegen's list of the species of *Arctia* are as follows:

ARCTIA MICHABO Gr.

This is set down as an aberration of *A. Arge*, which in my opinion is a mistake. At the time I described *A. Michabo*, all authors had followed Dr. Harris in considering *A. Dione* and *A. Arge* as simple synonyms. No one knew of a second species allied to our Northern *A. Arge*, to be separated as a Southern form under the name of *Dione* Ab. & Sm. Therefore it is possible that my species, described very fully in the CANADIAN ENTOMOLOGIST, vol. vii., p. 196, is = this *Dione*, which Mr. Neumoegen now asserts to be different from *Arge*. I cannot compare Abbot & Smith at present. But my *Michabo* is from Nebraska, where Mr. Dodge has reared it and found it entirely different from *Arge*, in a series of specimens. When I read Mr. Neumoegen's paper I at once remembered that I gave him the specimen described by me as a variety or aberration of *Arge* in the same paper above cited, and collected by Mr. Robinson at Brewsters. This is an *undoubted* aberration of *Arge*, and it occurred to me that Mr. Neumoegen has mistaken this aberration of *Arge* for my

Michabo. (By the way, if students would only take the trouble to refer to back numbers of the CAN. ENT., as well as other American publications, some articles would not be necessary; it is some excuse if the older illustrated works are not at hand, or foreign books, but none if American publications issued within the last 20 years are not gone over by new students). I must therefore strongly protest against *Arctia Michabo* being cited as an aberration of *A. Arge*, while I leave its relationship to *A. Dione* to be settled by those in the possession of the necessary material. In the meantime *A. Michabo* must be considered a good species, being larger than *A. Arge*, and nearer *A. Virgo*. Mr. Dodge will no doubt be able to furnish material to bear out my views. The unnamed aberration of *Arge* which I gave Mr. Neumoegen differs from the typical form in the fore wings being black, the veins alone broadly flesh color, so that the moth has something the look of a species of *Seirarctia*.

ARCTIA NEVADENSIS G. & R.

This species I refer to merely to state that if Mr. Hy. Edwards' *Incorrupta* is a form of the same species, even if more "typical," the above name, being much the oldest, must stand for the whole species, and our designation used only for the variety. When species are first collected it does not usually happen that they are brought in such quantities that in so variable a genus as *Arctia* the "ground form" can be ascertained and described. But it is positively certain that whether the first description cover the more usual or commoner form or not, the name so proposed *must stand for the whole species*, in future and when its limits are more accurately known. Any other course would be manifestly unjust and cause confusion. The species should therefore stand as *A. Nevadensis* G. & R., with its varieties *A. Ochracea* Neum., and *A. Incorrupta* Hy. Edw., as well as *A. Nevadensis* G. & R., for the special form illustrated by us, although I could see no strong differences. Upon one or two other points suggested by Mr. Neumoegen's paper, I could say a word, but the whole genus will soon be better known, and these minor points may well wait.

But I may conclude these remarks with a general observation on the species of *Arctia* described by myself from time to time during the past twenty-five years, since the genus contains very variable species and my own have been subject to frequent criticism.

The forms of *Arctia* which I have described (and for the most part figured) as distinct *species* are: *A. Saundersii*, *Persephone*, *Anna*, *Blakei*, *Nevadensis*, *Mexicana*, *Achaia*, *Michabo*. Assuming that I am correct in my present paper, that Mr. Neumoegen has wrongly identified *Michabo*, then these are all good species except *Anna*, which Mr. Neumoegen considers a black variety of my *Persephone*. In this, which has been before suggested, I believe the author is correct, since we have other black and yellow Arctians (and other moths) which vary in a similar fashion. I have never had sufficient material to determine the question; have never seen but one ♀ *Persephone*, which shared the ornamentation of the ♂. Consequently *Anna* may be a ♀ dimorphic variety. The stripes on fore wings are however narrower and paler also, as they seemed to me, hence my doubts. Added to this, the form *Anna* was *first* discovered by me, before I described the "ground form" *Persephone*. Other two forms of *Arctia* I have described, suspecting them at the time not to constitute distinct species, viz., *Stretchii* and *Snowi*. The first of these, differing only by the basal band of fore wings from *Intermedia*, is without doubt a variety, as Mr. Neumoegen treats it, and I was wrong in cataloguing it as distinct; I do not know, however, the differences between *Intermedia* and *Saundersii*. He considers *Snowi* as distinct from *Figurata* or *Decorata*, and in the absence of further evidence this is the correct course to pursue. In the face of the fact that the larvæ are not all known, we should not be hasty in drawing in forms of *Arctia*, which yet may prove to be only varieties. If we have finally to separate these again, it makes unnecessary confusion. When two forms exhibit such differences as are usually of a specific character, we are warranted in treating them as such, until proof is forthcoming showing them to be mere varieties. Breeding from the egg is the only sure way. On p. 7, Bull. Br. Ent. Soc., Mr. Hulst brings together four species of *Catocala*, with the *naïve* remark: "As may be imagined from the above, this (*C. polygama*) is a very variable species"! And this Mr. Hulst did in face of the fact that of two of the forms, *C. polygama* Guen., and *C. crataegi* Saund., the larvæ were known and described quite differently.

NATURAL HISTORY NOTES ON COLEOPTERA.

No. 2.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Harpalus viduus Lec. The type of this species was taken at Rock Island, Illinois. It must be somewhat rare, as it does not appear in any local catalogue nor exchange list under my notice. Here it is found in one place only, and that in some abundance—on the side of a high hill in its primitive state, possessed of a warm, friable, vegetable soil, with a scanty vegetation, and flat stones on the surface. The females have the elytra opaque, but not pubescent, as one of my correspondents claims they should be to meet the description of Dr. Leconte—"sericeo-opaca," which here evidently means opaque with a silky lustre. The males are moderately shining. The beetle makes its appearance during September and October, though few of them mature till the following spring, remaining under the shelter of the stones, where from one to half a dozen are often associated. At first the beetles are of a pale color, the elytra gradually changing to black; but the head and thorax mostly remain red till winter. In the spring they are shining black, and are only then fit to be placed in a collection. In the great struggle for "survival of the fittest" the chances seem to be against this insect.

Quedius fulgidus Fab. The descriptive synopsis of the species of this genus by Dr. Horn is so lucid that anyone with a little practice should be able to separate them without trouble, but in some individuals the departure from the normal form is so great and the approach to some other form so close as occasionally to produce perplexity. In the present species, as will be seen by reference to the synopsis cited, the color is so very variable as to be of no separative value, and the principal characters to be depended on to distinguish it from *peregrinus* Grav., which is equally variable, are the shorter, broader head, and the series of three punctures on the thorax external to the discal series. The form with the elytra red is the more common, and usually has the full number of punctures; but a totally black form occurs (legs brown), with the external series often reduced to two, or to the marginal puncture alone, and with the head considerably elongated, thus approximating it closely to black forms of *peregrinus*. When one has a number of both species of normal form to compare with, the determination of these abnormalities can be

made on the general fascies. The length of the antennæ is also of some use, being longer in *peregrinus*, but the relative length of the first and second joints is not permanent enough to be of value. *Fulgidus* is taken more commonly in autumn in and about decomposing vegetable matter. *Peregrinus* abounds all summer everywhere, and is quite arboreal and predaceous.

Dynastes tityus Lin. A gentleman sent me an immature living male and female of this species. They were taken in Clairborne County, Tennessee, early in December, from the decayed wood and humus that filled the cavity of a large yellow poplar, at the cutting down of which he was present. He writes, "there were a great many of them; they were all encased in oblong cases about three to four inches long and three inches in diameter, composed of the rotted wood in which they were imbedded; they were all soft and white; none of the natives had ever seen anything like them." Unfortunately he sent me none of the cases. When received, about three weeks after being taken, the male was assuming the greenish hue, and in three weeks more was normally colored. The female was entirely brown, and in four weeks had changed to nearly black; the black then began to fade, and in about four weeks more the beetle had taken on the greenish tint with the usual brown maculæ. No further change in color has occurred till the present, April 6th. It may be possible that the brown males and females mentioned by writers are immature individuals, as it would appear from the above that it requires from two to three months to perfect the colors. While no real stridulating organs are present, they have the power to produce a sound that may answer the same purpose, somewhat resembling that of an angry goose. The pygidium and part of the last ventral segment are very hairy, and by withdrawing the abdomen from the elytra so as to admit air, and then suddenly forcing it out through the hair by a sudden extension, a noise is produced that is rather alarming to one unacquainted with their harmlessness.

Prionus imbricornis Lin. Nov. 15th, 1884, I found a larva that in time produced this beetle. As it measured over three inches in length when at rest, it must have been nearly full grown; the skin was luteous and of a tough leathery consistence. It was about ten inches below the surface of the ground at the side of a large stone which it had struck in its subterraneous travels. The stone and the larva were carefully replaced

in their original positions. The first week in the following July I visited the place prepared to search for it, and soon found the course it had taken, and by carefully tracing for about eighteen inches, it was at length found inclosed in a cell of tough material, seemingly humus and leafy debris cemented by some secretion of its own. It made quite a large tunnel, eating the roots of the grass that formed a thick sod overhead, and built its cell about three inches below the surface. It was in a meadow, and there were no trees nor stumps near. I brought it home, being careful to not break the cell, and it shortly developed an average sized female *imbricornis*. From this it seems that some of the larvæ of this species of *Prionus*, like those of several *Elateride* species, bore through the earth, feeding on the roots of such grasses and plants as they fancy, which is confirmatory of the observations of Mr. C. V. Riley on the habits of a smaller form, considered a variety of this, that occurs abundantly on the treeless prairies of Illinois and other western States (Missouri Reports 2, p. 89). At the same time it is well established that other larvæ of this species live in both the living and the dead roots of trees, thus showing a large latitude of habit.

Clytanthus albofasciatus Lap. Is raised both from grape vines and from hickory limbs. There are two color forms produced indiscriminately that are so different in appearance that judged by color alone would form two species. The one is entirely black, with the usual anterior and posterior white bands on the elytra; the other is black with the antennæ brown; the part of the elytra anterior to the posterior white band, the femora, the coxal part of the prosternum, the meso and metasternum, rufous. This is exactly the color of the more plentiful form of *Cyrtophorus verrucosus*, and it is not difficult to confuse them. They may be readily distinguished by the compressed thorax and the spines of the antennal joints of the latter, as pointed out to me by Dr. Horn. The same color variation occurs in *Psenocerus supernotatus*. A few specimens of which taken on the wild gooseberry were entirely black, except the usual white markings on the elytra, and so different is the appearance that it required close attention to other characters to be convinced that they were the same species.

Physonata unipunctata Say. Mr. Caulfield, in the March number of the ENTOMOLOGIST; gives a very good account of the form *P. 5-punctata*. Those finding *unipunctata* would do good by making known its food

plant, and if they do not know it, if a sample is sent to me (in bloom if so found), I will be pleased to determine it. It seems to me that it is desirable to have them in collections as varieties, if not species. Besides color, there are two or three structural differences that appear sufficiently permanent to effect this. The black thoracic spot of *unipunctata* is elongate and divided longitudinally by a deep, acute incision; anterior to this is a transverse arcuate impression with the convexity posterior, and more or less apparent; in front of this impression the sides of the thorax have the appearance of having been pinched, so that the dorsal line seems somewhat roundly carinate to the thin apical margin. In *5-punctata* this spot is larger and more broadly oval; in some individuals there is a very shallow depression, while in others it is not observable; anterior to this the thorax is full and convex, without the compressed appearance of the other, and there is no trace of the arcuate impression.

Smycronyx griseus Lec. is often called for, though excessively abundant everywhere, occurring in August and September on the rag-weed of the fields (*Ambrosia artemisiæfolia*). At first the elytra are clothed with gray pubescence finely mottled with closely placed, minute whitish spots, and the thorax has four pale vittæ; but with age all these mostly disappear, the gray alone remaining. This is the species recognized as *griseus*, though the second joint of the antennæ is scarcely shorter than the first, and nearly twice as long as the third, not agreeing in this with Dr. Leconte's description in the Synopsis. *Brachytarsus tomentosus* is often found plentifully with it, and it may be well to remember that both species may be beaten from the trees and bushes bordering fields in which the weed grows.

Smycronyx tychoides Lec. Is found during August with *Barytychius amœnus*, on a variety of the great ragweed, *Ambrosia integrifolia*, though neither are so abundant as the preceding species. While belonging to different genera, it requires close inspection to separate them if rubbed, or old: *B. amœnus* has the sides of the thorax much rounded in posteriorly, and the disk as well as that of the elytra roundly depressed from the middle to base, which is much below the plane of the disks at middle: while in *S. tychoides* the bases are nearly on the same plane, though the thorax is as much rounded at the sides. The vestiture is of patterns about equally divided among the individuals. The one has a common sutural stripe blackish brown, the rest of the elytra being more or less rufous, and is

easily known ; the other is gray with indeterminate whitish, and requires care to distinguish it ; the most certain mark being the granular punctuation at the sides of the thorax, no other species that resembles it having this form of punctuation. Very few of the species of this genus can be satisfactorily determined from the Synopsis, and to Dr. Horn I am indebted for rendering the identity of the ones treated of certain.

Magdalis Lecontei Horn. The original describer gives its distribution as from Kansas to California and Oregon. To it has been referred a blue or blackish green species, much smaller (.15 to .18 inch.) found here, and of which I have specimens from Eastern Pennsylvania and Canada. While agreeing in having simple claws, non-serrate thorax and dentate femora, a comparison of the two forms shows them to be different. The western form has the back longer and more polished, the thorax more finely punctured, the elytral striæ finer, flat, the intervals broad, finely transversely rugulose with a very distinct row of punctures down the centre of each ; (length, .20 to .25 inch.) The other has the striæ wider and more coarsely punctured, the intervals semi-convex, narrow, coarsely rugose, and the row of punctures nearly obsolete.

Another form with blue elytra occurs on spruce, of which I have seen but one specimen taken here. The thorax is canaliculate and the hind angles more explanate than in *Lecontei*.

A quick method of cleaning greasy Coleoptera, etc. Lately I have employed the following method with the happiest results. It may be old and well known, but I do not remember to have seen it suggested. Dip the insect one half to one minute in spirits of ammonia (Liquor ammoniæ), wash in water (the hotter the better), and the thing is done. Offensive beetles like *Trox*, *Silpha*, etc., can be cleaned and purified instantly. How far the ammonia may be employed in cleaning Lepidoptera and other insects I do not know, but it renewed the beauty of two very greasy specimens of *Cossus Centerensis*.

This liquid also dissolves the verdigris that forms on the pins passed through insects ; but the insect must remain longer in the ammonia and be more carefully washed.

A LIST OF HEMIPTERA HETEROPTERA COLLECTED IN
SOUTH LOUISIANA.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

Now that we have been supplied by Mr. Uhler with a list of the Hemiptera Heteroptera of North America, which has been much needed, it will be interesting to know more about the geographical distribution of the species. The following list is short, but will nevertheless add to our knowledge of these insects. The species were collected at the same time and in the same localities with the Coleoptera given in my list (CAN. ENTOM., xvii., p. 66-73), and the preliminary notes there given apply also here. The species were kindly determined for me by Mr. Uhler.

PENTATOMIDÆ.

Mineus bioculatus Fab. One specimen taken on plants.*

Podisus sp. The nymphs of two species of *Podisus* were taken on wild plants; one black and reddish, and three smaller of a greenish color.

Euthyrhynchus floridanus Linn. One taken 25th May on plants along the wild side of a ditch, on the edge of a plantation. B. la F.

Ocbalus typhæus Fab. Two taken on plants. This species is not given in the Check List.

Euschistus sp. Two nymphs were taken on plants; they are probably two different species, though they look much alike.

Proxys punctulatus Pal. Beauv. Twenty taken, nearly all on 29th March, under dry logs near Lake Pontchartrain, at Milneburg.

Nezara vividula Linn. Two imagos taken 2nd June on plants, and one nymph at another time. B. la F.

Nezara hiliaris Say. One nymph taken on plants.

Edessa bifida Say. One taken about first of June, I think, on wild plants. B. la F.

COREIDÆ.

Metapodius granulatus Dallas. Numbers taken on thistles and other plants along ditches on plantations, and in other open sunny places. N. O.; B. la F. This is probably not the species so

* Where no locality is given it may be either, but is probably B. la F. Where no date, it is unknown, unless the species was more or less abundant during my stay.

often mentioned and figured in agricultural reports (first by Glover, U. S. Agr. Rep., 1855, p. 95, pl. viii., fig. 9) as *M. femoratus*, but it is nevertheless found in just such situations as are given for the latter, and is the only species I met with in the South. The locality of this species is given in the Check List as the Western States.

Leptoglossus phyllopus Linn. Numbers taken on thistles and in much the same places as the preceding. N. O.; B. la F.

LYGAEIDÆ.

Myodocha serripes Oliv. One taken under old wood?

Melanocoryphus bicrucis Say. Four taken on plants in May. B. la F.
This species I have also taken in Kansas and Michigan.

PYRRHOCORIDÆ.

Largus succinctus Linn. Fifteen taken in April on leaves of young shrubs of elder on a plantation. *In coitu*, 21st April. B. la F. This is no doubt the species referred to and figured by Glover (U. S. Agr. Rep., 1855, p. 94, pl. viii., fig. 7) as the "Red-edged-winged Reduvius," as his description applies well to this insect.

PHYMATIDÆ.

Phymata erosa H. Schf. Three taken on some roadside weeds in May. B. la F. The locality of this species was formerly given as Mexico.

REDUVIDÆ.

Zelus bilobus Say. One taken 22nd May on ragweed. B. la F.

Apiomerus sp. A larva taken under old wood?

Sirthena carinata Fab. Three taken in April under logs in damp places on the edge of the swamp. N. O.

Rasahus biguttatus Say. Four nymphs taken in April under logs in same places as the preceding species. N. O.; B. la F. The locality of this species was formerly given as the Western States.

Melanolestes picipes H. Schf. Six taken in April in same places with the two preceding. N. O. Have also taken this species in Kansas.

Conorhinus variegatus Drury. One nymph taken with the preceding species. N. O.

GALGULIDÆ.

Galgulus oculatus Fab. One taken in slow water in April. N. O.

BELOSTOMATIDÆ.

Zaitha sp. Three taken 17th April in slow water; another was taken also, which was being devoured by a specimen of *Cybister fimbriolatus* Say, all the under part of the abdomen having been eaten away. N. O.

Belostoma americanum Leidy. This species has been noticed by Mr. L. O. Howard (Ent. Amer., I., p. 54) as very abundant in New Orleans, being attracted to the electric lights. I have also referred to this fact in a note in No. 8 of Vol. I. of the same journal.

PARTIAL PREPARATORY STAGES OF APATELA
LOBELLÆ, GUEN.

BY G. H. FRENCH, CARBONDALE, ILL.

Found feeding on a wild cherry, September 19, 1884, two larvæ of this species. They were .80 of an inch long, nearly cylindrical, the body somewhat elevated in the middle, from which it tapers a little both ways, the dorsum of joint 12 with a slight elevation; eight low tubercles on each joint, from each of which arise a few spreading white hairs. Color green; a dorsal stripe that is mostly red on joints 3 and 4, and on the elevated portion of joint 12, the rest of the stripe yellow with a reddish blotch to each joint; the anterior part of dorsum of joint 2 red, separated by green in the middle, yellowish round the edges. Head slightly bilobed; the lower part reddish green, the upper part more red.

September 24th, they moulted when they were 1. inch long, the same shape as before. Color dark blackish brown, with a magenta dorsal line bordered each side with black, and a patch of the same color on the top of each lobe of the head. The dorsum of joint 2 is pale instead of magenta. Each joint has twelve small orange tubercles, each supporting a spreading tuft of gray hairs. They pupated October 1st, producing two imagines May 10th and May 19th, 1885. These are interesting larvæ in both of their last larval stages, as the colors are bright. The cherry upon which they fed is the common wild black cherry, *Prunus serotina*, the larvæ resting when found on the upper side of the leaf.

OBITUARY.

We deeply regret to announce the death of Mr. William D. Shaw, of Montreal, on the 29th of June, 1886, at the early age of 19 years. The deceased was well known for his early application to science, he having been the leading spirit in founding the Montreal Chapter of the Agassiz Association. Of this Chapter Mr. Shaw was Secretary and Treasurer, and in 1885 was appointed General Secretary for Canada. Mr. Shaw was also a member of the Council of the Montreal Branch of the Entomological Society of Ontario, a member of the Natural History Society of Montreal, and a member of the Astro-Meteorological Association. A devoted student of science, his loss will be deeply felt by his fellow workers. Unassuming, guileless and upright, his memory will ever be held in loving remembrance by those who had the privilege of knowing him.

CORRESPONDENCE.

ON EXPLOSIVE EMISSIONS FROM CARABIDÆ.

Dear Sir: There are other Carabidæ in our fauna which make an explosive emission from anal glands besides *Brachynus*. Mr. Ricksecker has observed the same in *Metrius*, and while I have taken these, I have never been so fortunate as to observe that act. The same is, however, done by *Psydrus piceus*. Many of our Carabide genera emit forcibly an irritating liquid, decidedly acid in its reaction, but without any explosive noise or with visible vapor; among these are *Cychrus*, *Calosoma*, *Carabus*, *Nomius* and *Chlaenius*. It is possible that *Calathus* does the same, as stated by Mr. Townsend, but the "white smoke" observed is probably the result of a chemical combination between the vapors in the cyanide bottle and the acid exudation, similar to that noticed when the vapors of hydrochloric acid and ammonia meet. Many of these exudations are not unpleasant to the smell, but in *Nomius* the offensiveness of the odor is entirely disproportionate to the size of the insect.

Philadelphia, April 28, 1886.

GEORGE H. HORN, M. D.

A CORRECTION.

Dear Sir: I described in the CANADIAN ENTOMOLOGIST, June, 1885, vol. xvii., p. 115, a new Ichneumonid for which I created the new genus *Platysoma*. But advised by my friend, Mr. E. T. Cresson, I recognized that this name was pre-occupied for a Coleopterous insect of the family Histeridæ. I propose in consequence to change this name in that of *Aplomerus* (from *aplous* simple, and *meros* thigh). Thus, *Platysoma tibialis* must be read *Aplomerus tibialis* Prov.

Cap Rouge, April 15th, 1886.

L. PROVANCHER.

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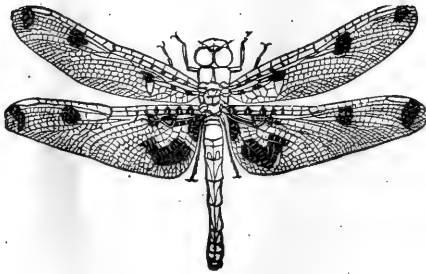
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PROF. FERNALD'S SPHINGIDÆ OF NEW ENGLAND.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

This very carefully written pamphlet brings us quite a step forward in our knowledge of the structure of our Hawk Moths. In the first place, it may be doubted whether the divisions of the Sphingidæ, first laid down in their present shape in Grote & Robinson's Synonymical Catalogue (1865), are not of lower rank than sub-families, but as all our divisions are based on comparative characters, this point need not detain us long. I had diligently searched the literature for older terms for these groups, finding them in part, but they were not adopted by Butler, and the terms of our Catalogue of 1865 with a sub-family ending seem to be preferred. I commenced with the Macroglossinæ, because these genera more resemble the Hesperidæ in their frequent diurnal flight, pupation on the ground between leaves with a few threads of silk, and in the more prismatic antennæ. Our genera are *Hemaris*, *Aellopos*, *Euproserpinus* and *Lepisesia*, with entire wings. I never was so fortunate as to possess any specimens of the genera *Lepisesia* or *Pogocolon*. Twelve years after describing *Lipisesia* from a specimen in Coll. Phil. Ent. Soc., another species of *Lepisesia* was sent me for determination from Cambridge, where accordingly my type of *L. Victorie* now is. This species is said to be the same as Boisduval's *Pogocolon Clarkiæ*, unknown to me. We have then at least two species of *Lepisesia*. I only know Abbot's figure of *Gauræ*; this represents a species with angulated wings, looking a little like the European *Cenotheræ*. In the Central Park Coll. is or was a specimen belonging to Mr. Robinson, brought by Mr. Ridings from Georgia. I thought, after only casually examining it, that it might be an allied species or a variety; but I never had it in my possession long enough to study. Nor do I know any of Mr. Hy. Edwards' species. Whether these are true *Pogocolon*, or whether this genus is distinct from *Lepisesia* (which is much the older term), I cannot at all say. But having

compared *Euproserpinus* I am satisfied that this is not *Lipisesia*; it is made a distinct section of *Macroglossa* by Boisduval; it is our nearest genus to *Macroglossa*. I have compared *M. stellatarum* with the species of *Hemaris*. Not only the opaque wings, but the vestiture, tuftings, head, neuration, give comparative differences which I set down as generic. It has been one of my studies, and I believe I am even the first writer to correct the statement that the European *Hemaris* has a vein on the cell; on removing the bar of scales I found no vein as described in European text books of ten or more years ago. We have no true *Macroglossa* and no true *Acherontia* in North America, though both are asserted. The remaining genera have the wings angulate, except *Arctonotus* and *Cautethia*. These are: the genus to which *gaurae* belongs, *Amphion*, *Thyreus* and *Deidamia*. If Prof. Fernald will examine the primaries of these three last genera, he will find them very like, also the body tuftings, though the abdomen is elongated in *Deidamia*, and has lost the plump typical Macroglossian form. But the larva has not the cordate head of *Smerinthus*, and I cannot class the moth with this latter, notwithstanding what Butler says. The fact that *Deilephila* also pupates like the first group and does not enter the ground, that the flight is often diurnal, the colors vivid, make me bring the *Chærocampini* in here. It is a noticeable fact that the lower genera of the Macroglossinæ and many Chærocampinæ feed on the grape. I have nothing to say upon these genera of the second group except that I believe *Ampelophaga* to be older than *Everyx*; if therefore *Myron* and *Versicolor* are congeneric, they may both be referred to this genus of Bremer's; while for *Chærilus* we may retain *Everyx*. Having studied extra-limital Chærocampid forms with angulated wings, I discovered an *Ambulyx* from Brazil with eye-spots like a *Smerinthus*, and I look upon this genus as a sort of passage to the Smerinthinæ in consequence, aided by the sunken head, brown colors with roseate patches, etc. The Smerinthinæ feed as larvæ on fruit and nut trees. We have one true *Smerinthus*, congeneric with *ocellatus* of Europe, viz., *ophthalmicus* from California. Then we have a type which deviates in small details and is represented by *geminatus*, having a representative in Asia Minor, as Butler tells us. Prof. Fernald points out that *Cerisyi* agrees with *Calasymbolus Astylus* in antennal structure, but I never saw *Cerisyi*, which, from the figure of Kirby, seemed to me like *geminatus*, with which, if I remember rightly, Kirby compared it. Probably there is nothing like *Astylus*, *Cerisyi* or *myops* in the Old World, and it would be

well if we accordingly restricted *Smerinthus* to the Californian species and separated our Eastern forms under *Eusmerinthus* and *Calasymbolus*. I used *Paonias* for *Excaecatus*, which differs by the scalloped wings. Also *Cressonia* for *juglandis*, correcting Dr. Clemens' notion as to the European *Populi*, which represents neither *juglandis* nor *modesta*, though nearer the latter. *Cressonia* is as distinct a genus as we have in the whole family. *Triptogon* is largely represented in Asia. I follow now with the Sphinginae, which enter the ground to pupate, commencing with *Ceratomia*, which in its larva approaches *Triptogon* and is a peculiar American form. I follow then with *Daremma*, *Diludia*, *Pseudosphinx* (= *Macrosila* Butler), *Amphonyx*, *Phlegethontius*, *Dolba*, *Sphinx* (= *Lethia*), *Dilophonota*, *Hyloicus*, *Ellema*, *Exedrium*. I do not believe these latter to be Smerinthinae, but low bombycoid Sphinginae. This group feeds especially on the Solanaceae, also Convolvulus and Privet. The tongue is often attached, like a jug handle, as Prof. Fernald says, to the pupa, which reposes in a naked cell under ground, the larva rolling the soil about it compact. I am glad Prof. Fernald uses *Phlegethontius*, which has priority and is a clean genus against which nothing can be said. If we study these insects carefully, I am sure we will finally accept all the genera, or nearly all, I have proposed. It is unwise to lose sight of the very clear characters which have been so well discussed by Prof. Fernald so far as his very readable pamphlet goes. I think when the extra-limital and especially South American forms are studied by the Professor, he may incline to place the Sphinginae where I have placed them. I have been guided by their subterranean pupation, their gray colors like the lower moths. The Macroglossians and the Chærocampians are gayer colored, day loving, active species. How often have I not taken *Lineata*, and also *Pandorus*, at midday. I am glad to see that my use of *Pandorus*, which was made after careful comparison with the true *Satellititia* of Linné, is being sanctioned. The reading of Prof. Fernald's pamphlet has given me great pleasure, and I should be affected and ungrateful not to acknowledge it. But it will have, with all that this author has given us that I have yet seen, a far more important value than the mere vindication of this or that name in our lists. It will show how much there is yet for us to learn about our moths, and also the way to learn it.

NOTES ON AN UNDETERMINED LEPIDOPTEROUS LARVA.

BY IDA M. ELIOT AND CAROLINE G. SOULE, STOWE, VERMONT.

We have found a caterpillar which we cannot identify, nor can any one to whom we have shown the description and a water-color drawing. "Papilio," Vol. iii., No. I., p. 14, has a description which is nearest it, but is not exactly like our larva, as ours has no tufts.

Our first specimen was found Sept. 12th, 1883, and our last one Aug. 13th, 1886. Between these we have three others; all of them pupated, but none emerged.

The larva is $1\frac{1}{2}$ inches long; the head is brownish-green with a whitish bloom over it; mouth parts dark; no marks or hairs.

The body is almost evenly cylindrical, tapering very slightly towards the head; green in color, very smooth, firm, and free from markings and warts, and evenly covered with long, silky hairs, cream-white in color, and growing singly, without warts or tufts which could be seen even with a powerful lens. The hair turns towards the head, and droops in a beautiful curve over the sides, almost as if parted on the dorsal line. There are a very few short black hairs, not noticeable unless looked for, scattered on the last three segments. The feet and prolegs are green, a little brownish at the tips. Spiracles are white and inconspicuous.

The larvæ were found, three on white birch, and one each on willow and poplar, all being curled around on the under side of leaves. In this position it always rests, with the head covered by the drooping hairs, and looks like a downy white feather. It is very beautiful and conspicuous on the tree, where it is always on one of the lower branches.

It is wholly different in appearance, and in the arrangement and quality of the hair, from the *Apatelas*, *Lophocampas*, or *Arctians*, or any of our common hairy caterpillars, and some of its habits also differ from these. Resting on the leaf-stem and beginning at the edge of the leaf, it eats into the middle, leaving the margin except where it began; or it rests near the stem, and eats the leaf all around, leaving only the part on which it is resting.

None of our specimens moulted, but just before pupation every one changed color, the body being olive brown, and the hairs dull black. On the day following this change the larva began to bore into a piece of rotten wood, entering head first, then backing out with the bits of wood it

had dug out collected between the props. When outside it opened the props and dropped the bits of wood. This operation was repeated until the hole was large enough, when the caterpillar entered for the last time, leaving its black hairs at the entrance.

The last one made but one opening to the hole, and did not, as far as we could see, spin a door across. Three of the others made openings at each end, and closed both with silk and hairs. The first one was kept in a paste-board box, and, no wood being given to it, gnawed a hole through the box. When we covered this hole, the caterpillar spun against the side of the box a thin cocoon of silk mixed with the bits of paste-board gnawed from the box. None of them would go into the earth when it was provided for them. The pupa of the second one was kept for two years, but showed no sign of life, and was then thrown away.

We should be very glad of any information about this larva that any readers of the ENTOMOLOGIST can give.

COLEOPHORA LARICELLA Hb. VERY INJURIOUS TO LARIX EUROPEA, IN MASSACHUSETTS.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

Professor Sereno Watson communicated to me some twigs cut on the grounds of Mr. Henry Watson, in Northampton, Mass. Several *Larix Europea* about thirty years old stand on an avenue, and have never suffered before. In April they showed to a large extent pale needles and many little larvæ of the well known sac-bearing form. In May numerous slate-colored moths appeared, the true *Coleophora laricella* Hub. This insect in all its stages is well described in Stainton's Nat. Hist. Tineina, vol. iv., p. 1, and figured on pl. i., f. 2. It would be useless to give a description here. Our biological collection possesses types of all stages by Rosenhauer, Zeller and Hofmann. As far as I know, it has not yet been observed in the United States. Some twigs given by the late J. Boll were perhaps collected in 1872 in Cambridge, Mass.; but as he did not mark any locality on the label, I am not sure that he did not bring them over from Europe. I am not able to find any published notice in North American papers. I may notice that the caterpillar keeps its abode very clean by expelling the fæces out of a hole in the needles.

Ratzeburg Waldverderbniss, Ton I., speaks at some length about the injury done by the insect. There is till now no remedy known for the insect, as the caterpillar is well protected in the needle.

This year *Chernes laricifoliae* A. Fitch, Rep. 4, No. 289, is very common in the Arnold Arboretum here. I do not find the species mentioned except by A. Fitch, of which Prof. Packard gives a copy.

EMBIA MINUTA, COSTA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

I am indebted to Sc. E. Bergroth, Helsingforz, for knowledge of this species. Prof. A. Costa has published, Atti della R. Accad. Sc. fisiche, etc., vol. vii., 1878, Napoli No. 2, the account of his journey through Egypt and Palestine. He was (p. 11) very interested to find, Feb. 17, after Assouan, at Kom-Ombos, on irrigated and humid grounds, a very small (long. corp. 5 millim.) species of *Embia*, for which he proposes the name *E. minuta*. As far as I know, nothing more has been given about this insect, and we will have to wait till Prof. A. Costa will publish its description. *Oligotoma Westwoodi* is the only species known of such small size, but it has only been found in copal.

A LIST OF THE NORTH AMERICAN SPHINGIDÆ, OR HAWK MOTHS.

BY A. R. GROTE, A. M.

The present List of the North American Sphingidæ or Hawk Moths embraces the principal features of my former Lists, in particular the division into groups, retained by Butler and lately by Fernald. I have originally in our Synonymical Catalogue (1865) proposed the genera *Macroglossa*, *Chærocampa*, *Smerinthus* and *Sphinx* as typical of the four principal groups recognized by me. A fifth group, represented by the Old World genus *Acherontia*, seems to me to fall in between the *Smerinthinæ* and *Sphinginæ*. It seems to me unimportant whether we consider these groups as Tribes, with the ending *ini* to the terms, or as Subfamilies,

with the ending *inæ*. I am myself of the opinion that these divisions are only of tribal value, and should prefer to so designate them. But, under this view, the Family Sphingidæ, as here considered, would remain only of Subfamily value, somewhat as intended by Dr. Harris, whose "tribes" have a wider significance, whereas I intend by "tribes" assemblages of genera subordinate in rank to Subfamilies, and as intended by LeConte in Coleoptera. These matters must be left, however, to final revisions of our classification. At this moment I am interested, in view of Prof. Fernald's recent valuable paper, in defending my sequence of the genera and groups as laid down in my former papers.

I have commenced with the Macroglossinæ on account of their diurnal flight, the frequent use of silk in the pupation, the fusiform antennæ, characters which ally the moths to the lower butterflies. I have, since 1865, pointed out that the European *Macroglossum stellatarum* is the type of a distinct genus from *Hemaris*; it is an Old World genus containing several species and differing from a large number of partially vitreous allies, by the abdominal tufts, the comparatively stouter antennæ, the thicker palpi, different vestiture, besides the thickly scaled wings. I denuded the wings of these forms, discovering that V. Heineman's statement that the cell of *Bombyliiformis* was crossed by a vein, to be incorrect, the bar being formed by scales only, and found certain slight neuronal characteristics which I no longer can refer to. The neurulation of *Lepisesia* is figured in my Sphingidæ of Cuba, p. 6 (1865).

The characters of the Family Sphingidæ are the narrow wings, the primaries long, the secondaries short; the frenulum is present; the fringes short, vestiture scaly and close; there is a general absence of tuftings and all impediments to a swift and continuous flight. The abdomen is heavy, long, usually tapering, the segments armed. The head is prominent, ocelli wanting, eyes naked, large; antennæ prismatic, maxillary palpi wanting, labial palpi thick, tongue variable but usually well and even excessively developed. Pupation sometimes on the surface in a slight web, but oftenest in the ground without cocoon. In the higher genera of the first Subfamily the wings are entire, in the lower, *Thyreus*, *Deidamia*, etc., angulated. These lower genera of the first Subfamily approach the Chærocampinæ, and I cannot interpolate here the Sphinginæ. The larvæ feed also on the grape and *Ampelopsis*; the young of *Thyreus* are comparable to *Philampelus* in the loss of the caudal horn and the assumption of a tubercle. While the larvæ of *Hemaris*, etc., feed in preference on

Viburnum, *Vaccinium*, *Lonicera*, the genera with angulated wings and the Chœrocampinæ generally are grape-feeders. *Everyx* and *Ampelophaga* spin surface cocoons like *Hemaris*. The colors of the lower Macroglossinæ are brown and green, with here and there light yellow, as on the secondaries of *Danum* and *Abbotii*. Claret red, olive green, sericeous yellow, are the tints of the first two Subfamilies, with rich browns and hard red tints; the gray colors of the Smerinthinæ and especially of the typical Sphinginæ are not as yet displayed. I think that, from the pupation, *Everyx* is higher than *Philampelus*, while from a structural study I have formerly brought *Deilephila* and *Philampelus* together. I merely remark here that in reference to recent statements, I do not know Abbot & Smith's *Gauræ*, nor any of the species with angulated wings referred here to *Pogocolon*. I had only examined and described the two species of *Lepisesia*, while from figures I should judge Abbot's species belonged to a different genus. While the higher genera of the Chœrocampinæ have the wings entire, often falcate, the lower have them angulated, and in the genus *Ambulyx* we have a species with ocellated secondaries. The colors become rich tints of gilded brown and yellow; roseate hues obtain largely and the spots on the secondaries prepare us for their final expression in *Smerinthus*. The ornamentation of the thorax in *Smerinthus* recalls *Philampelus*, *Ambulyx*. Although, on general grounds, I would admit that the Bombycid analogies of the Smerinthinæ lower them in the rank in the family, I believe the nearest approach to them at present existing is the genus *Ambulyx* among the Chœrocampinæ. The frequently pink secondaries in *Ambulyx* prepare us for the usually pink hind wings in the Smerinthinæ. Every indication from color, pattern and shape of wing, favors the idea that the two Groups, Chœrocampinæ and Smerinthinæ, are related. This is the main point of my arrangement of the imagoes, and I believe the known larvæ sustain this view of the relationships within the Family. The real gray colors only obtain as a rule within the Subfamily Sphinginæ; the Smerinthinæ are gray, tempered with brown shadings and with pink discs to the secondaries, as we see in some other moths, such as the Dryocampæ. The most splendidly ornamented Hawk Moths are to be found in the Chœrocampinæ, radiant in rich golden yellows and olives, and some Asiatic species are marvels of beauty. The larvæ of the Smerinthinæ feed by preference on fruit and nut trees. The larvæ of the Acherontiinæ and Sphinginæ on plants belonging to the

Solanaceæ (Tobacco, Tomato, Potato, Deadly Nightshade, etc.) A few species, such as *Paonias Excæcatus*, may be almost considered polyphagic; but, generally, the species are pronounced in their preference for special genera or families of plants. At last the gaudy colors yield to gray, in the Smerinthinae, suffused with rich brown and with pink shaded secondaries; the dull gray and blackish species at the most only relieved by yellow spots on the body in the Sphinginae. A few species have warmer tints, but the resemblance to the gray Noctuidæ becomes now apparent and the gay colors of the Chærocampinae do not again appear. The pupation is subterranean, the cocoon wanting, the flight crepuscular and even nocturnal. After a very diligent study of foreign genera, which we must always consider, I think the naturalness of the sequence as proposed by me cannot be gainsayed. There may be a better sequence for the genera here and there, within the groups, to be attained, but that the groups do thus better arrange themselves in a linear series, I am convinced, not leaving out of sight the fact that the relationship is net-like and not to be truly expressed by a straight line. As to particular points, I believe *Ampelophaga* is older than *Everyx*, which latter I retain for *Chærilus* with its spined tibiæ. I believe *Deidamia* to be allied to *Thyreus* by the shape of the wings. I follow Butler's extension of *Calasymbolus*, leaving *Eusmerinthus* as a subgeneric title for *Geminatus* with its bi-pectinate male antennæ. Our only true *Smerinthus*, as originally pointed out by me, is from the West Coast, but I believe the Californian species has also occurred in Upper Canada. We have in South Florida a West Indian colony, the extent of which is not yet known. Stragglers from the south, as *Ello*, *Titan*, *Labruscæ*, invade even New England. How far north these breed with us, is not known. They seem hardly to belong to the North American Fauna, but are all included here so far as they have been reported to me as being taken within the political limits of the United States.

In this list I have followed with a dash (—) all species not known to me in nature. (I trust my critics will observe these signs.) I have also used the sign † to denote erroneous identifications. In the localities of the species known to me I have tried to express my idea as to their distribution.

Family SPHINGIDÆ.

Sub-family MACROGLOSSINÆ.

Genus *Hemaris* Dalman.

1. *Palpalis Grote.* California.
2. *Thetis Boisd.* California.
3. *Cynoglossum Hy. Ed.*—
4. *Rubens Hy. Ed.*—
5. *Senta Streck.*—
6. *Aethra Streck.*—
7. *Tenuis Grote.* Can., N. Y.
Fumosa Streck.
8. *Diffinis Boisd.* N. Y., southward.
9. *Marginalis Grote.* Ohio, south and west.
10. *Axillaris G. & R.* Texas to Ill.
Grotei Butl.
11. *Metathetis Butl.* 1 —

(Subgenus *Chamæsesia* Gr.)

12. *Gracilis G. & R.* Maine; N. Y.

(Subgenus *Hæmorrhagia* G. & R.)

13. *Thysbe Fabr.* Can., southward.
Pelagus Cram.
dim var. Uniformis G. & R.
(?) var. min. Buffalœnsis Gr.
(?) var. maj. Floridensis G. & R.
14. *Fuscicaudis Boisd.* Georgia.

Genus *Aellopos* Hübn.

15. *Titan Cram.* Florida, northward.
Annulosum Swains.
Balteata Kirtl.
16. *Tantalus Linn.* Florida, northward.

1. How many of these eleven species, belonging to the typical group of *Hemaris*, are really distinct, it is difficult to say, and there must be careful breeding from the egg to decide. In collections *Tenuis* is usually labeled *Diffinis*, but the latter, from Abbot's and Boisdual's figures, differs in several points. Since Mr. Hulst has shown that *Uniformis* is only a dimorphic form of *Thysbe*, the value of the terminal band of primaries as a specific character becomes doubtful.

Genus *Euproserpinus* G. & R.

17. Phæton G. & R. California.

Erato Boisd.Genus *Cautethia* Grote.

18. Grotei Hy. Ed. Florida, Cuba.

Genus *Arctonotus* Boisd.

19. Lucidus Boisd. California.

Genus *Lepisesia* Grote.

20. Flavofasciata Barnst. Can., N. Y.

21. Clarkiæ Boisd. California, etc.

Victoria Grote.Genus *Pogocolon* Boisd.

22. Circeae Hy. Edw.—

23. Gaurae Abb. & Sm.—

var. Juanita Streck.—Genus *Amphion* Hübn.

24. Nessus Cram. Can., southward.

Genus *Thyreus* Swains.

25. Abbottii Swains. Can., southward!

Genus *Enyo* Hübn.

26. Lugubris Linn. Florida, northward.

27. Camertus Cram. Florida, northward.

28. Danum Cram. Florida, northward.

Genus *Deidamia* Clem.

29. Inscripta Harris. Can., southward.

Sub-family CHEROCAMPINÆ.

Genus *Everyx* Boisd.

30. *Choerilus Cram.* Can., southward.
Azuleæ A. & S.
Genus *Ampelophaga* Brem.
31. *Myron Cram.* Can., southward.
Pampinatrix Ab. & Sm.
var. Cnotus Hübn.
32. *Versicolor Harris.* Can., southward.
Genus *Chærocampa* Dup.
33. *Tersa Linn.* Southern States, northward.
Genus *Deilephila* Ochs.
34. *Chamaenerii Harris.* Can., southward.
Canadensis Guen.
? Intermedia Kirby.
? Oxybaphi Clem.
35. *Lineata Fabr.* East to west.
Daucus Cram.
Genus *Philampelus* Harris
36. *Vitis Drury.* Southern States.
Fasciatus Sulz.
Jussienææ Hübn.
37. *Linnei G. & R.* West Indies, Fla., Ga.
Vitis ‡ Cram.
38. *Pandorus Hübn.* Can., southward.
Satellitita ‡ Harris.
39. *Posticatus Grote.* West Indies, Fla.
Lycaon ‡ Gr.
40. *Achemon Drury.* East to west.
Genus *Argæus* Hübn.
41. *Labruscae Linn.* West Indies, northward.
Genus *Pachylia* Walk.
42. *Ficus Linn.* West Indies, northward.
Crameri Mén.

43. *Syces Hübn.* West Indies, northward.

Inornata Clem.

Ficus ‡ Mén.

44. *Lyncea Clem.* —

Genus *Ambulyx* Walk.

45. *Strigilis Linn.* 2 West Indies, Fla.

Sub-family SMERINTHINÆ.

Genus *Calasymbolus* Gr.

46. *Astylus Drury.* Can., southward.

Io Boisd.

Integerrima Harr.

47. *Myops A. & S.* Can., southward.

48. *Cerisii Kirby.* Can., Maine, N. Y.

Subgenus *Eusmerinthus* Gr.

49. *Geminatus Say.* Can., southward.

var. Jamaicensis Drury. —

Genus *Smerinthus* Latr.

50. *Ophthalmicus Boisd.* California.

var. Pallidulus Hy. Ed.

Genus *Paonias* Hübn.

51. *Excaecatus Ab. and Sm.* Can., southward.

Genus *Cressonia* G. R.

52. *Juglandis Ab. and Sm.* Can., southward.

♀ *Pallens* Streck.

var. maj. Robinsonii Butl.

2. This species, *Phil. Posticatus*, *Amph. Duponchel*, have been reported to me from South Florida, but I have seen no specimens. The same is true of *Macrosila Ochus*, reported to me from South Texas. It is probable that most of the Cuban *Sphingidæ* may occur sporadically on our shores.

Genus *Triptogon* Brem.

53. *Modesta* Harris. Can., southward.
 Princeps Walk.
 Cablei Von Reiz.
54. *Occidentalis* Hy. Ed. California, etc.
 Imperialis Streck.

Subfamily SPHINGINÆ.

Genus *Ceratonia* Harris.

55. *Amyntor* Hübn. Can., southward.
 Quadricornis Harr.

Genus *Daremma* Walk.

56. *Undulosa* Walk. Can., southward.
 Brontes ‡ Boisd.
 Reptentinus Clem.
57. *Hageni* Grote. Texas.
58. *Catalpae* Boisd. Southern States.

Genus *Diludia* G. & R.

59. *Jasminearum* Boisd. and Lec. Ga., northward.
60. *Leucophaeata* Clem. —
61. *Brontes* Drury. —

Genus *Dolba* Walk.

62. *Hylaeus* Drury. Southern States, northward.
 Prini A. & S.

Genus *Amphonyx* Poey.

63. *Antaeus* Drury. West Indies, Fla.
64. *Duponchel* Poey. West Indies, Fla. (?)

Genus *Phlegethontius* Hübn.

65. *Rustica* Fabr. Southern States.
 Chionanthi A. & S.

66. *Ochus Klug.* Mexico, Tex. (?)
Instita Clem.
 67. *Carolina Linn.* West Indies to Can.
 68. *Celeus Hubn.* Can. southward.
5-maculata Steph.
Carolina † Harr.
 69. *Cingulata Fabr.* Southern States, northward.
var. Decolora Hy. Ed.

Genus *Hyloicus* Hübn.

70. *Plebeius Fabr.* Can., southward.
 71. *Sequoiae Boisd.* —

Genus *Ellema* Clem.

72. *Bombycoides Walk.* Can., southward.
var. Harrisii Clem.
 73. *Coniferarum Ab. and Sm.* Southern States, northward.
 74. *Pineum Lintn.* —

Genus *Exedrium* Gr.

75. *Halicarnie Streck.* —

Genus *Sphinx* Linn.(= *Lethia* Hübn.)

76. *Drupiferarum Ab. and Sm.* Can., southward.
var. Utahensis Hy. Ed. Utah.
 77. *Kalmiae Ab. and Sm.* Can., southward.
 78. *Chersis Hübn.* Can., southward.
Cinerea Harris.
 79. *Oreodaphne Hy. Ed.* —
 80. *Libocedrus Hy. Hd.* —
 81. *Perelegans Hy. Ed.*
 82. *Vancouverensis Hy. Ed.* West Coast.
Vashti Streck.
 83. *Canadensis Boisd.* Can., southward.
Plota Streck.
 84. *Gordius Cram.* Can., southward.
 85. *Albescens Tepper.* —

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86. *Luscitiosa Clem.* N. Y., Maine, N. J.
 87. *Lugens Walk.* Western States.
 Eremitoides Streck.
 88. *Eremitus Hübn.* Can., southward.
 89. *Separatus Neum.* —
 90. *Dollii Neum.* —
 91. *Elsa Streck.* —

Genus *Dilophonota* Burm.

92. *Ello Linn.* West Indies, northward.
 93. *Melancholica Grote.* West Indies, northward.
 94. *Merianae Grote.* West Indies, Mex., Tex.
 95. *Festa Hy. Edw.* —
 96. *Obscura Fabr.* Southern States.
 97. *Edwardsii Butler.* —
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BROTIS VULNERARIA HUBN.

BY GEO. D. HULST.

In the CANADIAN ENTOMOLOGIST, this volume, p. 72, Mr. Ph. Fischer tells us of the capture of the above moth at Buffalo, N. Y., adds something of the bibliography of the species, and remarks upon its aberrant appearance and character. Permit me to add a few words to what was there said.

Guenee, *Phalenites*, vol. ii., p. 116, 1857, describes this species of Hubner, under the generic name *Sphecelodes*, crediting the species to Hubner, but ignoring his genus, as was Guenee's custom. He also describes the ♀, and pl. 22, f. 9, gives a figure of it. It differs very much from the ♂, having ciliated antennæ, and lacking the triangular flesh-colored costal spot. He is as much in doubt as was Hubner, as to its classification, but places it among his *Fidonidæ*. Walker, *Cab. Brit. Mus. Geometridæ*, p. 213, 1860, catalogues *vulneraria* under *Brotis* Hubn., placing *Sphecelodes* Guen. as a synonym of the genus. He also is in doubt as to the proper location of the genus, but places it at the end of the *Ennominae*, and says it does not seem to fit well anywhere. Guenee's

five specimens were from Brazil. Walker's five specimens were from St. Domingo. Neither seemed to have any doubt that the insect was a Geometer, though a somewhat anomalous one.

In the CANADIAN ENTOMOLOGIST, viii., 154, 1876, Mr. Grote tells us: "A drawing which I recognize as of this species (*Brotis vulneraria* Hub.) has been shown me by Prof. Hinsdale, of Racine, Wis., where the original was taken. I would not refer it to the Geometrae, but to the Noctuae (Fasciatae)." In the CANADIAN ENTOMOLOGIST, xii., 116, 1880, under the heading "North American Noctuidae in the Zutraege," Mr. Grote, after mentioning its capture as above stated, says: "Hubner considers it to be a Geometer, but I think incorrectly." But neither in these places, nor elsewhere that I can find, does Mr. Grote give any hint as to his reasons for his determination of the place of the insect.

In Papilio, iv., 72, 1884, Rev. W. J. Holland describes as new, *Sphelodes floridensis*, from Indian River, Florida. I have one of his type specimens, but am not able to separate it specifically from *vulneraria* Hubn.

From the above it seems the species ranges from the Lakes to Buenos Ayres. It is probably common through the Tropics, and may be common in Southern Florida.

So far as its classification is concerned, it seems to me to be beyond doubt a Geometer. Antennae, head, venation and legs are all geometri-form.

ENTOMOLOGICAL NOTES, SPRING, 1886.

BY A. W. HANHAM, HAMILTON, ONT.

Owing to the unusual and continued warmth of the weather during the two weeks ending April 28th, insect life has been very abundant, considering the time of year, and the few opportunities I have so far enjoyed of looking up their haunts have amply repaid me.

April 17.—Under boards and pieces of wood along fences were to be seen hundreds of *Drasterius dorsalis* Say. In company with this *elater*, besides many, to me, common beetles, I secured for the first time several *Languria Mozardi* Latr., a very showy beetle—the male looks very small by the side of the female. In the same afternoon I found a fine specimen

of the goldsmith beetle, *Cotalpa lanigera* Linn. Is not this an early appearance?

April 18.—Observed Hymenoptera and Diptera in large numbers and variety on and about a row of young sugar-maples, the bark of which had been punctured. Some hibernated Lepidoptera could have been easily secured by hand had I felt so inclined, so engrossed were they in imbibing the sweet sap. There were, however, too many Vespidae about for me to care to do much investigating.

April 23.—I found *Erycus puncticollis* Lec. very plentiful under logs and debris generally, along the edge of the marsh near Dundas. These weevils were all paired. Among some others taken the most conspicuous was *Sphenophorus pertinax* Oliv. Many Elateridae were taken from under the bark of stumps and fallen logs. They included several *Adeloceras*. I was fortunate enough to find a pair of *Cychrus Lecontei* Dej. copulating under a piece of wood. Also *Brachylobus lithophilus* Say. Other Carabidae were numerous, especially near the water. A better locality could hardly be found for the last named family. *Bothrioderes geminatus* Say, and *Chrysomela clivicollis* Kirby were among my captures this day.

April 26.—Took *Dicaelus elongatus* Dej., a few Silphidae, and from under the bark of decaying stumps lots of small beetles, mostly Scolytidae.

April 27.—Two fresh specimens of *Staphylinus maculosus* Grav. from under stones.

May 1.—Discovered a good hunting ground a few miles from town, near the lake, namely, a few acres of thinly wooded forest land, on which were the stumps of many freshly-cut hardwood trees. On these, and especially under the chippings surrounding them, Coleoptera were very abundant, the most common being *Hylobius stupidus* Boh., *Clerus dubius* Fab., and several species of Nitidulidae (Ips). I captured one specimen of *Grynocharis 4-lineata* Mels., and a pair of *Cytilus trivittatus* Mels. On several of the stumps in sheltered nooks I came across patches of that beautiful lady-bird, *Megilla maculata* De Geer. Some of the larger patches must have contained quite fifty beetles. They were mostly of a lovely bright pink color; a few, however, had a brown or reddish tinge. About this date I took, in quantities, *Byturus griseus* Lec. ? off wild raspberry canes, evidently feeding on the opening buds. A little later in the year they are common upon the blossoms of the wild plum and cherry.

I must have taken or observed over thirty species of Carabidae during

my rambles on the days mentioned, some of them rather scarce ; also the following Cicindelidae : *C. Lecontei* Hald., *C. sexguttata* Fab., *C. purpurea* Oliv., *C. vulgaris* Say, and *C. repanda* Dej., the first named being the only rare or local kind. In walking over some sand hills or tracts on April 23rd they arose from about my feet almost in clouds. I do not remember to have met with them so abundantly before except late in the summer.

Cut-worms of many sizes and markings appear to be common this spring under boards, stones, etc. One morning about the beginning of May I noticed a sand wasp (Pompilidae Leach.) dragging a cut-worm, apparently nearly full grown, to its nest in the sand. When first seen by me the wasp was a foot or more away from home. The larva was not only much larger but heavier than its capturer, and much too weighty to be carried. The wasp found it quite an undertaking, for it left its prey several times, going to the nest, only to return for another pull. It is not unlikely that the distance covered previous to my arrival was considerably more than that while I was present.

I intend in the course of a few weeks to trespass further on the kindness of readers of the ENTOMOLOGIST by the insertion of continued notes.

ON WILLOW AS FOOD-PLANT OF *P. TURNUS*.

BY W. H. EDWARDS, COALBURGH, W. VA.

In Nov. No., 1885, I asked if readers of this magazine had ever found the larva of *Turnus* feeding on willow, etc., to which I have had several replies.

Mr. W. Brodie, Toronto, Can., wrote that on Sept. 10, 1885, Thos. Parks, of Toronto, found three larvæ in his garden under a peach tree, and he put them in a box and fed on peach leaves for several days, and till pupation. So far as I know, the peach has not before been observed to be a plant of *Turnus*.

J. D. Sherman, jr., Peekskill, N. Y., writes that his father, who once had a very large collection of American butterflies, "states positively that he has several times taken the larva of *Turnus* from the wild willow."

Miss Caroline G. Soule, of Boston, Mass., writes : "I have found more larvæ of *Turnus* on willow than on any other plant. I have found it on ash and poplar, but if I hunt for it, I take willow as the plant most likely to supply my need. This is in Stowe, Vermont, where most of my

entomological work is done. So marked was the preference for willow, that I find written on the margin of my *Insects Injurious to Vegetation*, 'chiefly willow, sometimes poplar.' I have always raised my *Turnus* larvæ on willow." And Miss Soule quotes from a letter from Miss I. M. Eliot, of New York, "with whom my summer work is done," and to whom she had mentioned the subject: "I wish Mr. Edwards could have seen the willow where we first found *Turnus*!"

Also, Wm. Bentenmüller, of New York, writes: "I have frequently found the larva of *Turnus* feeding on willow."

It is therefore settled beyond all question that willow is one of the food plants, though I do not learn that it is known to many collectors. Mr. Scudder quoted willow in his "*Butterflies*," but from a statement made by Mr. Gosse in 1845. And as I have before said, my larvæ at Coalburgh died before they would eat willow, and the plant was offered them repeatedly. As the same thing happened with me when I gave spice wood and sassafras to larvæ of *P. Ajax*, though in Tenn. Mr. Aaron says these larvæ certainly will eat both these plants, I conclude that larval habits as to food may differ decidedly in different localities.

ANNUAL REPORT, 1885.

Owing to unforeseen circumstances, the distribution of the Annual Government Report for 1885 has been unavoidably delayed. We are glad to state, however, that they have at last been received and forwarded to those members entitled to receive them.

ANNUAL MEETING.

The Annual Meeting of the Entomological Society of Ontario will be held in the Society's Rooms, London, Ontario, on Wednesday, October 20, 1886, at 7.30 p.m. Members are invited to prepare papers to be read, and to send them to the Sec.-Treas., Mr. E. B. Reed, if they are unable to attend.

CORRESPONDENCE.

Dear Sir: I notice in my article two serious errors that I overlooked in the proof, one clerical and the other typographical: Page 112, 11th line from bottom, read *dorsal* instead of ventral; page 115, 13th line from top, read *beak* instead of back.

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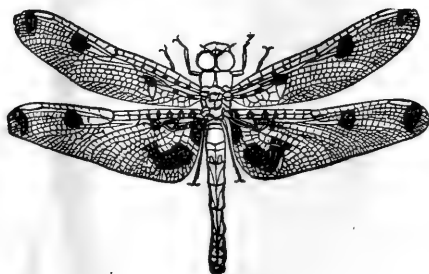
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LONDON, AUGUST, 1886.

No. 8

ON THE HISTORY AND THE PREPARATORY STAGES OF FENESICA TARQUINIUS, FABR.

BY W. H. EDWARDS, COALBURGH, W. VA.

Nothing has been known of the history or earlier stages of this butterfly till quite recently, except what Boisduval and LeConte (1833) gave, both plate and text having been copied from Abbot (about 1800). On the plate the mature larva is represented as lying on a leaf of Hawthorn, and the chrysalis is attached to a stem of same. The larva is green and white-striped, and neither in coloration nor shape resembles the real larva, and the description in the text is made up from the figure. The chrysalis is a little better. The larva (according to Abbot) "lives upon *Cratægus*, and the species is very scarce." We also read that "this butterfly is plainly quite unlike the true *Polyommatus* in its caterpillar and the shape of its chrysalis. Godart, who knew this species only by the description of Fabricius, wrongly believed that it was an *Erycina*." Boisduval puts it in *Polyommatus* with *Phleas*.

The late Professor Glover figured the mature larva and the chrysalis on plate xxii of his *Lepidoptera*, but the larva is surprisingly ill-done, being studded with round knobs that have no place in nature. The chrysalis is fairly done, and both dorsal and side views are given. On another plate is copied Boisduval's figures with no alteration (B., fig. 5). Mr. Glover told me that the larva fed on Hawthorn, and I believe that plant alone is written in his original work.

Many authors have spoken of the butterfly, and according to Prof. Riley, Mr. Scudder has given quite a list of food plants in different papers, as *Alnus*, *Ribes*, *Vaccinium*, *Viburnum*, and conjecturally, Arrow-wood, Elder, Hawthorn.

At a meeting of the Ent. Soc. of Washington, 6th Jan., 1886, "a letter was read from Mr. C. L. Johnson, stating that he had observed a lepidopterous larva feeding on a species of *Aphid*, and had bred the insect to maturity. Mr. Lugg stated that the larva was that of *F. Tarquinius*,

and that he had also made the same observation several years in succession; though he had never actually seen them feeding on the Aphids, they were always found among them." At a subsequent meeting, Feb. 11, 1886, "Mr. Howard read a note from Prof. Riley in relation to the food habits of *F. Tarquinius*, in which it was stated that he had had for some time in his notes the records of observations by Mr. Pergande, who had found the larvæ actually feeding on the following species of Aphididae: *Pemphigus Fraxinifolii*, *Schizoneura tessellata*, and *Pemphigus imbricator*. The last named species is the one referred to by Messrs. Johnson and Lügger, at the last meeting." Ent. Amer., vol. 2.

Prof. Riley gave an abstract of the accounts by different authors of *Tarquinius*, in "Science," Vol. 7, No. 169, April 30, 1886, and of what was known as to its food, and stated four reasons why it was "more than probable" that different species of plant-lice "are the normal food of this larva." The essential reasons are the first and fourth. That attempts to feed the larvae on leaves had proved futile. That both Mr. Lügger and Mr. Johnson had found the larvae, but never dissociated from the plant-lice. But, concludes this paper, "neither of these observers were able to get positive proof of the fact." That is, I suppose, "proof of the fact" that aphides were the sole food, because all the gentlemen named had seen the larvae eating aphides.

That is all, so far as I know, which has been published on this matter to the present date. I am pleased to be able to say now that the full history of *Tarquinius* from egg to chrysalis has been followed out the past season, by Miss Emily L. Morton, of New Windsor, Orange Co., New York, well known as an enthusiastic lepidopterist. It has cost much patient labor, the observations having to be made mostly at a distance from home, in difficult ground, and running through several weeks. But the object has been attained, and I think little can remain to be discovered about the habits of *Tarquinius*.

Miss Morton kindly wrote me her notes from day to day, and sent eggs and larvae repeatedly, as well as supplies of aphides. Also sent the same to Mrs. Peart, at Philadelphia, so that drawings could be made at every stage. I propose to publish these drawings soon in But. N. A., Vol. 3.

Miss Morton wrote 11th Aug., 1886: "I saw a *Tarquinius* laying an egg on the twig enclosed (alder). She flew about and finally settled on the branch, depositing the egg right in the middle of the aphides. From

the care with which she settled in the midst of these creatures, I thought the larvae might possibly live on them. So I cut off the twig and send it to you. This female is in a bag in the woods where I found her." (I should say here that Miss Morton knew nothing of observations on *Tarquinius* by other persons. It was all new ground to her.)

On 13th Aug.: "The female laid but a few eggs, and those on the side of the bag, but I saw two more butterflies this morning, and both acted just as did the first one, carefully selecting a place in the midst of the plant-lice, in spite of a large black and red ant, which in great numbers was guarding the aphides. I watched closely, though I had to stand in the brook, and after some time I saw them lay 3 or 4 eggs, all among the aphides. I then cut off the limbs and brought them home, first bagging the females on the spot. After brushing off the lice, I found a dozen eggs, all on under side of the twigs. There were a few queer looking other eggs *on the leaves*" (perhaps of the grubs afterwards spoken of,) "also one small hairy larva, which I do not think can be *Tarquinius*, but as it possibly may be, I send it."

Leaving the letters for a little while, I will give my observations on the eggs and larva spoken of. One egg had not hatched, two or three had, and the shells remained, each with a hole eaten out of the top. They did not look to me like Lycaenid eggs, and I thought there must be some mistake about it, and that they were of some moth, or possibly Hemipterous. They were button-shaped, flat at base, lying nearly full breadth on the bark and firmly set, not quite circular; the curve at top like that of *Lemonias Nais*, not like *Lyc. Pseudargiolus*, the central depression broad and shallow, the surface somewhat rough, with no appearance under a Coddington lens of network; color pale yellow. Now all Lycaenid eggs known to me are covered with an elaborate and conspicuous lace-work, or are much sculptured. And the little larvae did not look like Lycaenid larvae. Rather like Tortrices, and their movements suggested that. The same thing struck Miss Morton. They were slender, of even thickness, each segment rounded, the body itself rounded, the feet, legs and head not in the least retractile; the hairs long and short, disposed very much as in some of the Nymphalidae, say *Grapta* or *Phyciodes*, the head as broad as body, and obovoid, but prolonged at the mandibles; on segment 2 a chitinous bar; color whitish-green.

I wrote Miss Morton forthwith that I could see no probable *Tarquin* eggs or larvae. However, I went in search of aphides, first visiting a

Hawthorn bush which I had set in my garden years ago expressly that I might some day have food for larva of *Tarquin*, and on which there had been myriads of aphides a few weeks before. But I now found none. The elms were visited with same result. At last I found a few on weeping willow, and put them in a glass tube with the larvae. I watched some time, but there was no haste on part of the larvae. I saw one of them go to an aphid, nose at it, push it and bite at it, lifting it partly off the leaf (the aphid being the larger of the two) and shaking it as a dog would shake a rat. But the victim escaped and retreated to the reverse side of the leaf, and the larva rested. Next morning, not an aphid was to be found. I got another small supply of willow aphides and presently saw a larva bite an aphid near the head and eat into the body so that its own head was buried, the aphid not resisting, nor even removing its sucker from the leaf. After a moment the larva let go and went its way.

Not finding more aphides on willow, I searched many trees and shrubs in vain, but at last found a young wild plum somewhat infested with them, and thereafter had a moderate supply. But there soon began to arrive boxes of twigs of alder covered with large woolly aphides, and eggs and larvae in all stages, sent by Miss Morton. The young larva (and the habit continues through the two earlier stages) pushes its way under the large aphides, or in case of such as are found on plum and willow, among them, and forthwith begins to spin for itself a loose web, not close enough to conceal it from view were the aphides away, but sufficient to keep the aphides from walking over the body, and to protect it when the moult is approaching and the skin sensitive. The web seems to be just about the length of the larval hairs from the body. The aphides may be seen running over it, and often get their legs fast in the meshes, and are very apt to be devoured as a consequence. Receiving these other eggs and larvae, I had pretty soon become satisfied that these hairy larvae were of *Tarquin*. The first stage was about two days in duration.

At first moult, the body was not so round, but a little flattened, and a little broadest in middle, the dorsum not raised, the legs and feet not retractile; the head a little within 2, but not more than with a *Papilio* larva; body clothed with many long hairs disposed in six rows, two sub-dorsal, one on mid-side, one along base; the hairs not in tufts but in groups, which spring from low tuberculous swellings; the hairs from base falling down and fringing the body; on 2 a chitinous band and in front of it 3 or 4 rows of long hairs which fall over head.

Miss Morton wrote 18th: "I have often found on the alder a hairy red and gray larva which produces an Apatela, and I thought the small larva I first wrote you about might be that. But if you saw it and the others were all like it, of course it can't be that." On 19th: "This morning I found what I think is a full-grown larva. It was resting in a fork of the bush close to a large colony of the aphides, but while I was wondering how I should get it in my box, so high on the limb was it, the way was suddenly made plain by a large ant rushing at and biting it furiously, and the larva curled up and fell to the ground. I thought I had lost it, but it fell on a bare spot, and here it is in a tube for your investigation, together with two other smaller larvae found feeding on the aphides. These were in a very thin web directly under a mass of aphides, and both were in the act of eating, each with an unlucky aphid kicking on its back, the head of the larva buried in its body. I have two more now before me, and both are devouring from underneath as fast as they can the swarms of aphides collected around them. There was a curious creature walking up and down the aphides, pulling the wool off them and sticking it on its own back. I removed it, fearing it might injure the young *Tarquins*, such formidable jaws had he." *

On 21st: The ants do not let the larvæ alone, but bite at them furiously whenever they see them; but until nearly grown the larvae lie concealed under the aphides with a web covering them, and cannot be got at by the ants without disturbing their cows. I went to the swamp again to-day to watch these most interesting creatures, and under nearly every pile of aphides found either eggs or larvae. But the larvae are so covered with the wool of the aphides and their webs conceal them so effectually that it is most difficult to detect them even with a powerful glass. The day was cool and cloudy and I did not see a single butterfly, but found about a dozen eggs and small larvæ, besides two nearly as large as the one I send you. There were places on the limbs of the alder where evidently full-grown larvae had cleaned off the aphides. At one place, the ants, a very large species, with black head and abdomen, and red thorax, were in a state of great excitement, running and biting in every direction, and had probably just discovered and routed a full-grown larva, as a large brown spot with all the aphides cleared off showed itself on the limb."

* This creature was a larva of a *Chrysopa* or Lace-Fly. See Harris' Ins., plate 3, page 247, for habits.

On 26th: "I went to-day to another swamp where I found quite a number of aphides, all on the stems of alder, some so low down as to be under the grass. There was also one butterfly flying, but I could not catch it. I got, however, one egg, which I mail to Mrs. Peart. There is a small *Syrphus* fly grub which devours the aphides far faster than does *Tarquinius*. I took 6 from the twigs of aphides which I send you to-day. These grubs stick the wool from the aphides upon their own backs, and are often difficult to detect.*

"After second moult, I find the larvae crawling naked on the limb seeking for fresh supplies of food; then they again spin a web, which they leave after the aphides are consumed. I do not think they spin after third (the last) moult. They then go about very quickly. There are four species of ants guarding the aphides on the alder, and I find fewest *Tarquinius* larvae among those guarded by the black and red ones I before told you of, though the butterflies do not seem to fear them in the least. The female lays her eggs generally close to or among a bunch of aphides, but occasionally on the leaf, if it rests on the aphides. The latter do not feed upon leaves unless just at the junction of them. On putting in a fresh supply for the larvae they at once burrow under and devour the aphides from the under side, unless after third moult, when the larvae eat roads through, but still from the under side, their backs covered with wool from the unlucky aphides. I think the wool prevents eating from above, for I noticed the larvae eat the red aphides from cherry from the back, or wherever they seized them."

Aug. 30th: "Each stem has to be cleared of ants, some species of which not only bite sharply enough to draw blood, but also sting, and cut off with a knife, the slightest jar often knocking off the aphides and such larvae as are not in webs. Then there is what I take to be a *Syrphus* larva which has to be removed, as it devours twice as many aphides as do the *Tarquins*. These lie under the aphides, often in a web of the *Tarquins*, and are very difficult to find."

Sept. 3rd: "Last night I saw a *Tarquin* just out of egg and watched it for over an hour spinning a web close to and almost under a large *Syrphus* grub. So I do not suppose these grubs injure the *Tarquins*. It crawled under the mouth of the grub and over its back, without the least

* *Syrphus*-fly grubs. See Harris, p. 248.

notice being taken by the grub." In another letter a farther observation is made going to show that the relations of larva and grub are not unfriendly.

Sept. 4th : "Have you noticed the ape's face which the chrysalis shows, when looked at upside down?"

At the second moult, the body was higher, and was broader in middle, and was more the shape of maturity, the hairs more abundant; the feet and legs not retractile; the head more covered by next segment than before, but very little, and that only along forehead.

The growth of these larvae is remarkable for rapidity, scarcely more than two days between moults, and there are but three moults in all. Such haste to reach chrysalis is what might be expected when one considers the nature of the food, its precariousness, and the activity of the enemies the larva is constantly exposed to. There is no long interval preceding a moult when the larva lies helpless, and this is particularly so at the third moult, when the larva is fully exposed to view. I watched several most carefully when I anticipated the third moult, but never was able to see it, or to know precisely when it occurred. I could see that a moult must have taken place by the fresh and differently colored skin of body, and the enlarged head. Miss Morton at first experienced the same difficulty, and wrote 30th Aug. : "Thursday morning the larvae had devoured every aphid in the box, and I remembered seeing some red aphides on wild cherry near the house. These I put in until I could go to the swamp, a mile away. When I returned, 3 hours after, three of the five larvae had moulted, after eating nearly the whole of the two square inches of aphides, though there was no appearance of a moult when I went away. These three had changed from the whitish and gray to the mature orange (on dorsum) and pupated Sunday morning (i. e., 3 days after 3rd moult.)" But Sept. 21st : "Since writing on the moults, I have seen the three, and have now eight larvae in all stages from first to last." Mrs. Peart also detected the third moult, and sent me four tables of the length of the several stages of as many larvae.

At third moult, the larva is .44 inch long, and .14 inch broad in middle, the sides tapering about equally either way; the dorsum is flattened broadly, and is highest at 6; the under side flattened; the feet are not retractile and the pro-legs cannot properly be called so; the head is covered more than before. As the stage proceeds, the head is more and more concealed by the growth of segment 2, but there is no extensile neck as in *Lyc.*

Pseudargiolus or *Thecla Henrici*, both which species I have described in their early stages; the low swellings before spoken of form three rows on either side, and on these are the clusters of hairs as before, but more numerous; and the lower hairs make a fringe as before; the color of dorsal area is pale gray, the outer edges white, and the side is white, with a pale brown macular stripe running through it, and above this is an oblique brown bar on each segment, except at the extremities; on mid-dorsum a macular brown stripe, and on 7 to 11 four brown rounded spots, two in front, two on rear; the sub-dorsal swellings are red-orange, or Indian red, or pinkish; there is much variation in individuals in all the markings; and I suspect the species of aphids fed on may cause variations, as one larva raised by me wholly upon plum aphides was at all stages whiter than those on alder, and the darker markings pale. The chrysalis of this larva was also lighter than any I have seen.

The chrysalis is .31 to .39 inch long, .12 to .15 inch broad at mesonotum, .18 to .22 at abdomen; extreme height of abdomen .2; the ventral side flattened and rounded laterally; the head case is prominent on ventral side, and nearly shape of larval face; behind it, and projecting somewhat over it, is the second segment, broad and incurved; the front of both 2 and 3 are turned up a little, so as to increase the excavation of 2; mesonotum prominent and nose-like, but flattened, and with a decided carina; followed by a considerable dorsal depression, and a deeper one on side, in which is an oval eye spot, as if set in; next, the abdomen rises abruptly, overhanging the depression like a brow on face; the abdomen is very high for width of three segments, then diminishes rapidly, and on dorsum rounds down to 13, but the sides of 11, 12 are greatly compressed; 13 is rounded and widened at the edges, and lies flat on the object to which it is attached like the hoof of a horse; the under side shows a flat rim, and a rounded interior depression, on which last is a broad circle of minute points; under a high power these look like so many walking sticks, with their straight handles bent at an angle of about 40°; color of ventral side whitish, glossy, more or less dotted with dark brown; the second segment white; mesonotum whitish and black; the eye-spot spoken of glossy black; the abdomen brown, grading on the sides into yellowish; dark patches on sides of 6, 7, 11, 12; the whole upper surface indented and roughened, but has a glossy appearance.

In all, the monkey's face is a conspicuous feature, the overhanging

brow, the deep-set eyes, the flattened nose, the curled and open lips (the white second segment.)

The chrysalis is closely pressed to the object by the shape of its last segment, but is also held by a girdle which passes over dorsum between 4 and 5, and is free at the upper lids of the eye-spots.

On 22nd Sept., I found that one imago had come from chrysalis, and was dead and dry. I suppose the period in this case was about 10 days. The other chrysalids will hibernate.

From laying of egg to hatching 3 and 4 days; in one instance in which Miss Morton saw the egg laid, the larva came forth at 3 days, and had reached 3rd moult at 9 days, date of the letter. One egg sent me hatched 29th Aug., 1st moult 31st Aug., 2nd moult 3rd Sept., 3rd not observed; pupation 8 Sept. Allowing 3 days for egg period, that would make 13 days from laying of egg to chrysalis, a pace unequalled in my experience. In the case of *Agraulis Vanilla*, C. Ent., 12, 125, from egg to pupation was 16 days, the shortest period I think recorded by me.

The larvae, at Coalburgh, have several times been without food for many hours, or two or three days, and pupation has taken place when they were dwarfed from starvation. They always had plum leaves in the tubes, but never eat of them. I asked Miss Morton about this, and the reply 21st Sept., says: "I can answer as positively as you could wish. I left in the swamp, where I saw the first butterfly, four eggs in a bag, on a limb with leaves and a small cluster of aphides. Being prevented from going again for several days, I found the larvae hatched and three of them gone; not a trace of them in the bag, which I emptied on a sheet. The fourth larva was still alive, but stunted and weak. Being put in with fresh aphides, it eat ravenously, and finally changed to a very small pupa. It certainly had not eaten of the leaves. Besides this, I have always had a few leaves in the tin box with larvae and aphides, but even when the latter are entirely gone, the *Tarquins* have never touched leaves except to make their chrysalids on them. I have found that the larvae prefer leaves for pupating on."

On 24th Sept., I received from Miss Morton three larvae in 2nd, 3rd, 4th stages, and experimented with them amongst aphides on willow and plum, all small and naked species. The ants on willow are of a small species, honey-colored, those on plum of same size, but black. I laid the smallest larva on willow leaf directly by a small cluster of aphides, at which few ants were engaged. The larva paid no heed to the aphides,

but walked past and back and forth and was on both sides of the leaf. The ants were somewhat inquisitive but did not trouble the larva, nor were they disturbed by it. This went on for about 15 minutes, when I removed the larva.

I put the next sized larva (2nd moult) on same leaves, and the ants were agitated, ran about gesticulating, but paid more attention to their cows than to the larva. I put this larva on a plum leaf by a large colony of aphides, at which were a dozen of the black ants. The ants sprang at it, bit at it everywhere, especially trying to get a hold under the edge of the body, where the surface is naked, or at the joints of the segments, or at 2, which being bent over the head is more exposed than any other segment. One determined fellow seized on 2 and was hardly to be dislodged, was at last by violent jerking of the head, but wounded the larva so that blood flowed. When the attack was at the joints the larva squirmed so as to tighten the joints just there. These attacks were simultaneous and by at least six ants at a time. The larva crawled away and the assailants mostly dropped off. I thought it best to come to the rescue, else I should lose the larva.

I then put the largest larva (3rd moult) amongst the same excited ants, and they attacked it in same manner, but seemed unable to make impression on it. The hairs protected the whole upper side more sufficiently. The larva crawled up and down and over the leaf, followed by some of the ants, who attempted to seize it at every vulnerable part. But no harm was done. I repeated the experiments the next day, and came to the conclusion that the willow ants were mild-tempered, and seemed unlikely to hurt a larva; but that the black ones were fierce and would attack wherever they saw their enemy.

Now it may be that the butterfly avoids the fiercer ants and the aphides they guard, and therefore that the larvae are not to be looked for on certain plants. There is room for farther observation on this point.

I had noticed that whenever one of these larvae was removed by forceps a thread held it to the object, and I watched when making the experiments related to see if the ants would force the larvæ to drop from the leaf. But they did not drop. I shook the largest larva out of the box till it let out a thread a length of four inches. Then held the box to see if the larva would climb the thread, which it did, in about 20 minutes. It twisted its body into a spiral and whirled about so fast that I could not bring the lens to bear, but I could see that jaws and feet were active,

Now, all young lepidopterous larvae spin threads, and in falling guard themselves by this means, but I certainly never saw or knew of this habit in an adult butterfly larva. Adult or middle-sized Lycaenid larvae double up and fall on least provocation, but use no cord. Here would seem to be a means of defence in a larva always liable to sudden attacks.

Miss Morton calls my attention to the fact that ants do not disturb the larvae of the Syrphus flies, which with either woolly larvae, or naked species, as on cherry, devour far more aphides than do the *Tarquins*. "One would suppose the ants would at least expostulate in some way at the wholesale destruction going on, but though I have watched until the aphides were nearly devoured, the ants did nothing but pet their cows." Perhaps the wise ants have learned to submit to the inevitable.

I watched these larvae at every stage to see in what degree the legs and feet were retractile, and they certainly are not at all in the earlier stages, that is, up to second moult. Nor in the remaining stages any more than is the case with a Papilio larva. Mrs. Peart, who from drawing figures of feet and legs of many species and genera of butterflies, is accustomed to notice such points, writes me: "Through all the stages they seem to be the same as in Papilio larvae, but the fleshy legs are very short." I found a mature larva of *Lyc. Pseudargiolus* and placed it on glass slide by side of a mature *Tarquin*, and the difference in the appearance of and the handling of the legs and feet, was decided. If at the last stage *Tarquin* may be held to have the pro-legs at all retractile, as that word is used in describing onisciform larvae, it is but imperfectly, and not after the manner of the Lycaenidæ.

I should have said before that on looking at a stem of alder, which may be completely covered by the aphides, there will appear inequalities on surface, little hillocks as it were; and on pulling these apart, small larvae of *Tarquinius* will probably be found, in their webs. None at all will be visible, unless they are nearly mature.

Miss Morton writes, 23rd Sept.: "*Tarquin* gets itself stuck over with the wool of the aphides, and the Chrysopa larva, running over the *Tarquins* as well as the aphides, pulls the wool off the former also. I have watched, but never saw one of these formidable creatures bite or annoy a *Tarquin*. When the *Tarquins* moult, they come out bright and clean, but by the time they crawl their own length, they are again stuck over with wool, and this is the case till pupation. They are naturally so exactly the

color of the aphides on alder that I should not suppose the wool would be necessary to their preservation."

Also: "I have never found a chrysalis. though I have looked for them whenever I have been in the swamps. My larvae generally seek a leaf, but I think it probable the wild ones crawl down the stems and pupate among sticks or grass." The larva of *Lyc. Pseudargiolus* when ready to pupate drops to the ground.

The observations settle these points: that the eggs are laid directly among the aphides, and in case of stem-aphides, on the bark; that the ants do not destroy the eggs (though usually ants destroy every egg they find); that the larvae from egg to past second moult conceal themselves under the aphides, and under spun webs of loose texture, through the meshes of which they devour their prey, and which webs also serve to protect them from injury, especially at moulting time; that the larger larvae, that is, from before third moult on, are in full view, but besides being coated with wool from the aphides, have ways of protecting themselves from enemies, as by falling off the stem, throwing out a thread, or by falling to the ground; that there is no period, at any moult, of much length when the larva is helpless, and apparently none at all at third moult, when it is most exposed; that there are but three moults, and the whole larval period is exceptionally short; that the larvae will eat many species of aphides (possibly any, unless deterred by certain species of ants), but prefer the large, woolly ones.

I have repeatedly had letters from different parts of the U. S. and Canada, asking if I knew on what the larva of *Tarquinus* fed, and in nearly all cases the writers stated that the butterfly had been taken on or near alders.

Prof. Riley, in the Science paper quoted, notes that this is the only butterfly known whose larva is carnivorous. But next to nothing is known of the early stages of tropical butterflies, especially in the great family of Erycinidae. Both there and among the Lycaenidae there may be species which have this same peculiarity.

Godart conjectured that *Tarquinus* should be classed with Erycina. His instinct was right; *Fenesica* belongs to the Erycinidae. The present classification of butterflies, based as it is solely upon one stage of the four, is imperfect and at best but temporary, and is sure to give way to a better as the early stages of species become known.

At Coalburgh there would appear to be at least three broods of the

imago of *Tarquinius*. I have taken it in several years, in April, from 17th to end of the month and 5th May. Again in June, from 14th to 4th July; on this latter date I took 24, in 1868, and saw large numbers more; and again last of July, in several years. And I have repeatedly bagged the females on hawthorn, led thereto by what Prof. Glover told me, but always have failed of getting eggs. I have taken these examples generally up the branches of the creeks, flying about the stones in the nearly dry beds thereof. I remember that on the occasion spoken of when I took so many, the butterflies persisted in visiting a large stone, and I caught most of my examples by a bottle, so tame were they. So far as I know there were no alders or hawthorn within a mile of the points where the butterflies have been abundant. There were plenty of beeches, but the probability is that many trees or shrubs on which there was a good supply of aphides would attract the females.

I know nothing about the broods of this species at the north. As we have seen, eggs and larvæ were found at New Windsor from middle of August to last of September.

NOTE.—After the above lines had been sent to printer, on 4th Oct., I received three nearly mature larvæ of *Tarquinius* from Mr. Henry F. Schönborn, at Washington, D. C., on alder. No information was received respecting these larvæ.

ON THE PREVIOUS STAGES OF PTINIDÆ AND ALLIED GROUPS.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

A small round box of bamboo (8 by 6 inches) was bought nine years ago in Hong Kong, China, and brought home to Boston. It was placed on a little shelf on the wall, and used for Turkish tobacco. The box was lined inside with a perfectly closing box made of East Indian block-tin, about a millimetre thick. I examined the box January, 1885, and found it hollowed throughout like a sieve, and containing between the tin box and the bamboo cover a large number of dead and living beetles and two living larvæ. The tin box had four small round holes apparently cut through by the insects. The beetles represented two species, one, a little

larger, only two specimens, all the others belonging to the second species. I submitted the beetles to Dr. G. H. Horn, and received the following kind answer :

"The beetles are not specifically known to me. The *Lyctus* (the numerously represented species) is different from any we have. The other is a Bostrichid, and is allied to *Sinoxylon*. There is just enough to show that the last three joints of the antennæ form a loose club as in *Sinoxylon*."

Therefore as the beetles are not yet known living in the U. S., they must have been imported from China, and lived and propagated in the bamboo box. I remembered directly a similar fact represented in the biological collection here. In 1870 was presented by Mr. J. H. Hubbard from Detroit, Mich., a piece of Supple-tack, a vine of Jamaica, imported nine years ago. Only during the last two years was observed fine mealy dust dropping out of numerous small round holes. By splitting the stick many living beetles and larvæ of a species of *Lyctus* were discovered.

I tried to make out the Chinese species, but Harold's Catalogue has no species of *Lyctus* or *Sinoxylon* from China. Lewis's Catalogue of Japan has *Lyctus brunneus* Steph. By comparing the description and figure in Steph. Illust. iii., p. 117, pl. 18, f. 4 (Wollaston Ins. Mad. were not at hand), and Kiesenwetter, Insect. Deutschl., v., p. 17, I suppose that the Jamaica species may be *L. brunneus*. This insect is given as imported by trade into Germany, and has been raised by Mr. Fuss out of walking sticks made from the so-called Cuba vine.

I compared the Jamaica and the China specimens, and find the latter ones identical with the smaller specimens of the lot from Jamaica, as I was not able to find any difference. But some of the larger specimens from Jamaica have a decidedly stronger sculpture on the thorax. Being well aware of the difficulty of determining species of *Lyctus*, and not having to compare a specimen of *L. brunneus*, I may only draw the attention of American entomologists to this species. It would be surprising if a species so widely spread and imported into Germany to the Baltic shores, and living in the Antilles Islands, should not be found in the United States. Considering the species near *Sinoxylon*, I am not able to give a determination. The larvæ in the bamboo box belong very probably to *Lyctus*.

In my Bibliotheca, ii., p. 499, are related all cases of insects boring through metals, mostly lead. I do not know if block-tin is known as in-

jured by insects as in the bamboo box from China. I believe that the boring was done by the species allied to *Sinoxylon*, because only very few holes were made, and because a related species, *B. capucinus*, has bored lead.

As it is of general interest to know the history and the habits of the insects belonging to this obnoxious and dangerous group, I have tried to make out the species of which the previous stages have been described. Therefore I have given a catalogue of the 32 species represented to-day in the biological collection of the Museum in Cambridge.

Besides these, Harold's Catalogue mentions 28 species more, of which the previous stages are described; Rupertsberger mentions 29 species more, and Riley 2 from the U. S.

The species of Ptinidæ and allied forms represented in the earlier stages in the biological collection in the Museum, are in alcohol, and besides, dry inflated larvæ; also parts of wood or other things in which they have made borings. For want of time and space, a very large lot of later additions have not been classified and arranged. There may be among them more species from North America.

PTINIDÆ.

- Hedobia imperialis* L. Europe. Im., larv., nymph, and bark with the cradle.
- Ptinus fur* L. Europe. Im., larv.
- rufipes* F. Eur. Im., larv., wood bored.
- Anobium tessellatum* F. Eur. Im., larv.
- pertinax* L. Eur. Im., larv. *Betula alba* injured.
- striatum* Oliv. Eur. Im., larv., nymph., wood of *Aesculus Hippocastani* injured.
- emarginatum* Duft. Eur. Im., larv., nymph, wood of *Pinus picea* injured.
- nigrinum* Er. Eur. Im. larv., wood of *Pinus sylvestris* injured.
- paniceum* L. Eur. Im., larv., boring in candy; the same species from U. S., boring in the pith, larv.; also destroying insects—Mr. Austin.
- Ernobius abietis* F. Eur. Im., larv., boring in cones of *Pinus picea*.
- mollis* L. Eur. Im., larv.; the same from U. S., boring in pine sap-wood; boring in corks.
- Ptilinus costatus* Gyll. Eur. Im., larv., boring in *Salix alba*.

Lasioderma serricorne F. Eur. Im., larv., boring in *Cacuma longa* from East India.

Mesocoelopus niger Muell. Eur. Im., larv.

Dorcatoma chrysomelina Strm. Eur. Im., larv.

Dresdensis Hlst. Eur. Im., larv., and cells in *Polyparus frumentarius*.

Caenocara bovistæ Hoffg. Eur. Im., larv.

Anitys rubens Hoffm. Im., larv., boring in *Quercus pedunculata*.

BOSTRYCHIDÆ.

Apate (Bostr.) *capucina* L. Eur. Im., larv., and a larva type from Ratzeburg.

Dinapate Wrightii Horn. Cala. Im., larv., from Horn's types.

Xylopertha sinuata Fr. Eur. Im., larv., nymph, boring in *Quercus pedunculata*.

LYMEXYLONIDÆ.

Hylecoetus dermestoides L. Eur. Im., larv., nymph; borings in *Fagus sylvatica*; also types from Prof. Ratzeburg. Larva, borings in *Fagus sylvatica* and borings in oak, a fact not known before (c. f. Ratzb. Waldverderbniss, ii., p. 151), from Stolberg in Harz.

lugubris Say. U. S. Im., larv., nymph; borings in elm, from Trenton Falls, N. Y., by Mr. H. J. Hubbard, May 20, 1874.

CIOIDÆ.

Lyctus canaliculatus F. Eur. Im., larv., nymph; borings in *Quercus pedunculata*.

opaculus LeConte. Philadelphia. Im., larv., nymph; types sent by Dr. LeConte.

planicollis LeConte. California. Im., larv.; raised by Dr. Horn from borings in Mesquit wood, from San Diego, Cal., 1884.

striatus Say. U. S. Raised from hickory, the types of the borings figured in the Hub. 1879, presented by Dr. Horn.

brunneus Steph.? Jamaica. Im., larv.; raised from borings in a vine.

sp., perhaps the same. China. Im., larv.; raised from the bamboo box from China.

Rhopalodontus perforatus Gyll. Eur. Im., larv., nymph. In *Polyporus frumentarius*.

Ennearthron affine Gyll. Eur. Im., larv.; in *Polyporus squamosus*.

Octotemnus sp. Detroit, Mich. Im., larv.; in old sponges, by Mr. H. J. Hubbard, Aug., 1874.

Of the 668 species given in Harold's Catalogue, the previous stages of 100 species are published. They belong to 34 genera of the 81 enumerated by Harold. Only of 28 genera of the 53 enumerated in Mr. Henshaw's Catalogue of the Insects of the U. S., the previous stages are known. Only of 13 species of the 176 mentioned by Mr. Henshaw have the previous stages been described.

THE NORTH AMERICAN GENERA OF ANTHRACINA.

BY D. W. COQUILLET, LOS ANGELES, CAL.

The sub-family Anthracina differs from any other of the Bombyliidæ, as well as from any other group of Diptera known to me, in that the second vein issues from the third at a point opposite or nearly opposite the small cross-vein, the distance being never greater than the length of that cross-vein; the course of the third vein at the place where the second vein issues from it, is perfectly straight, while in the other Diptera the third vein bends obliquely downward at the same angle that the second vein extends upward at its base.

The genus *Dipalta* O. S. must be united to *Anthrax* Scop. It was founded upon a species (*serpentina* O. S., West. Dipt., 237) which differs from a typical *Anthrax* only in having three submarginal cells in each wing instead of two, and also in that the second vein is strongly bent S-shaped before its tip. I have two undescribed species which agree in every particular with *D. serpentina* O. S., except the course of the second vein; in one of these species this vein is nearly as strongly bent S-shaped before its tip as in *serpentina*, but in the other species it is not more strongly curved than in an ordinary *Anthrax*. The number of submarginal cells in each wing—three in *Dipalta* and normally only two in *Anthrax*—will not serve to separate these two genera, since specimens occur in several different species of *Anthrax* in which there are three

submarginal cells in each wing, and occasionally there are three of these cells in one wing and only two in the other wing of the same specimen. Thus every gradation between these two genera occurs, making it necessary to unite them under the older name.

From *Exoprosopa* proper I have separated those species in which there are four submarginal cells in each wing, the third being divided into two cells of nearly an equal size. I have examined numerous specimens of this group from all parts of the world, and in every specimen of any given species the number of submarginal cells in each wing is very constant. For the genus which shall contain these species I propose the name *Velocia* (from *velox*, swift); the *Anthrax cerberus* Fabr. may be regarded as the type of this new genus.

My new genus, *Mancia* (from *mancus*, defective), although most closely related to *Anthrax*, is sufficiently distinct; its separation from *Anthrax* is the more desirable as the latter genus already contains a great many species.

The following table contains all the genera of the Anthracina known to occur in North America:

- | | |
|---|--------------------|
| 1—Pulvilli pad-like, distinct; wings usually with only two submarginal cells..... | 2 |
| Pulvilli spine-like or wanting..... | 3 |
| 2—Tip of antennæ bearing a pencil of hairs..... | <i>Argyramoeba</i> |
| Tip of antennæ destitute of a pencil of hairs..... | <i>Hemipenthes</i> |
| 3—Style at tip of third antennal joint at least one-fourth as long as that joint; wings with three or four submarginal cells..... | 4 |
| Style at tip of third antennal joint minute or wanting; wings usually with only two submarginal cells..... | 5 |
| 4—Wings with only three submarginal cells..... | <i>Exoprosopa</i> |
| Wings with four submarginal cells, the third being divided by a cross-vein into two cells of nearly an equal size..... | <i>Velocia</i> |
| 5—Axillary cell not longer than twice the distance between tips of last two veins; third basal cell widest at its apex..... | <i>Mancia</i> |
| Axillary cell much longer than twice the distance between tips of last two veins; third basal cell not widest at its apex..... | <i>Anthrax</i> |

Genus MANCIA, n. gen.

Same as *Anthrax* except that the axillary cell is not longer than twice the distance between the tips of the last two veins, and the third basal cell is wider at its apex than at any other part. Wings tapering considerably toward the bases, axillary cell very narrow. (Name from *mancus*, defective).

Mancia nana n. sp.—Front black, reddish tomentose and black pilose; face yellowish, much produced below, middle part white, the sides reddish tomentose; antennæ black, first joint sometimes yellowish, base of third joint subglobular, the styliform portion slender and linear; proboscis projects from one fourth to one half its length beyond the hyperstoma. Occiput reddish tomentose. Thorax black, mixed white and reddish tomentose; pleura reddish tomentose. Scutellum black, reddish tomentose. Abdomen black, reddish tomentose, a cross-band of white tomentum on the second segment. Venter black, white tomentose. Legs reddish, yellowish tomentose; front tibiæ sometimes provided with bristles; tarsi black, claws of front tarsi well developed. Wings hyaline, a brown cloud in middle of first basal cell, faint brown clouds on veins at bases of first submarginal, first and fourth posterior cells, and of the discal cell. Length $3\frac{1}{2}$ – $4\frac{1}{2}$ m. m. Cal.; 20 specimens, in April.

ON CECIDOMYIA LIRIODENDRI.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The two galls of the Tulip tree described by Osten Sacken, Monogr., Vol. I., p. 202, No. 26, *C. liriodendri* n. sp., and No. 27, *C. tulipifera* n. sp., were wanting in the collection of his types presented by the Baron to the collection of the Museum in Cambridge. I am glad to state that I collected one of them in considerable numbers on leaves from a young Tulip tree on Quincy Street, Cambridge, in October, 1885. But all those galls were burst open along a part of the margin, and were empty. Prof. G. W. Farlow presented some collected in Newton, Mass., Oct. 12, 1886, and I found the living, full grown larva in one gall. I remembered then the tree in Cambridge, and found the same galls numerous, but again all empty. Apparently the larva has to be collected in the beginning of

October, or somewhat earlier. It is possible that the brown or reddish halo around the galls appears only later, after the larva has left the gall; at least the only gall containing a larva had no halo. The larva and its breast-bone agree with the Baron's description. But I was very much interested to find in the body of the larva two large eggs, with an embryo similar to those described for *Miastor*. We may conclude therefore that *C. liriodendri* also can be propagated by the larva. Perhaps the very numerous galls found often on the same leaf, of different sizes, may be the results of this kind of propagation.

In comparing the galls in the collection, I found very similar ones on *Fraxinus americana* (*C. pellex* O. S.), on *Quercus tinctoria* (*C. symmetrica* O. S.), on *Carya* (*C. caryæ-lamina* Walsh, and *C. glutinosa* O. S.), and on *Tilia americana* (*C. verruricola* O. S., CAN. ENT., 1875, p. 201). Osten Sacken, l. c. p. 202, speaks of similar spots on the leaves of the Tulip-tree produced by a Lepidopterous larva. I presume they are made by *Nepticula* or by *Phyllocnistis*.

Of the 32 species of *Cecidomyia* galls described in Monograph, Vol. I., p. 190-205, besides the two from the Tulip-tree, 4 are not in his collection, *C. cynipsea* from hickory, *C. erubescens* from oak, *C. impatientis* from *Impatiens fulva*, and *C. agrostis* from *Agrostis*.

CORRESPONDENCE.

A CORRECTION.

Dear Sir: I wish to correct the statement made by me on p. 13 of the present volume of this journal, in regard to a pupa of *Elaphidion parallelum* Newm. being found inclosed in a silken cocoon. The cocoon in question was undoubtedly that of a parasite.

C. H. T. TOWNSEND, Constantine, Mich.

Dear Sir: In the article on explosive emissions from Carabidae, June No. CAN. ENT., I notice that the genus *Harpalus* is not included. While collecting in Conn. about a year ago, I took *H. caliginosus* in large numbers on the flowers of the rag-weed. Several filled my cyanide bottle with a dense white smoke. I noticed no explosions outside of the bottle.

GEO. F. CURTISS, Lynn, Mass.

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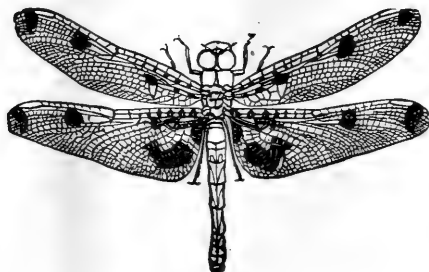
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No. 9

CATOCALA NOTES.

BY G. H. FRENCH, CARBONDALE, ILL.

C. SAPPHO, Strecker.—Last season five specimens of this rare species were taken near here, and it was found about ten miles further north than before. It is as constant in its markings as any species.

C. RETECTA, Grote.—Both the pale and the dark forms of this species were taken last year, with intergrades. I should probably have taken them this season, but I was away from home at the time they were flying. In the woods the habits of the two forms are alike.

C. FLEBILIS, Grote.—This species is pretty constant here, the ground color being rather dark bluish gray, with the blackish longitudinal shade. A specimen in my cabinet from Pennsylvania that I received for *Flebilis* seems to be a stunted form of *Desperata*.

C. TRISTIS, Edw.—This beautiful little species has been found near here for three seasons.

C. RELICTA, Walk.—Through the kindness of Mr. James Behrens my cabinet contains a specimen of this species taken at Portland, Oregon, one of two captured August 22, 1885. It does not differ materially from our eastern forms, being intermediate between vars. *Bianca* and *Phrynica*. This is the first record I have seen of it further west than Illinois and Wisconsin.

C. WALSHII, Edw.—From the material that I have seen, it would seem to me that this ought to be far enough removed from *Junctura* to be at least a variety. The ground color is pretty uniform, and is nearly the same as that of *Nebraska*.

C. ADOPTIVA, Grote, *Delilah*, Strecker.—Has been taken near here twice, a single example each time; and *C. Consorts* once.

C. PALAEOGAMA, Guen.—Singular freaks in insect life are illustrated in this species. Some seven years ago fifty of these could be taken in the woods in a single afternoon. Since that season scarcely one could be

found till last year, when they began to be numerous again, and are more abundant this year.

C. AMASIA, A.-S. Var. VIRENS, *n. var.*—This differs from the usual form in having more clear white for the ground color, very few brown scales in the median space below the median vein, the costal brown patch inside the t. a. line mixed with olive, a similar patch on the hind or inner margin, with traces only of brown and olive between. In the usual form this forms a continuous shade across the wing. The subterminal shade has only traces of brown in its anterior part, while the rest of the way the brown is pale. But the principal feature is an olive green shading that accompanies nearly all the black markings and forms shades below the forks of the median vein, and shades the terminal space. Described from one ♂, but it does not seem to be a sexual variation. I have males and females without these characters, as well as intergrades.

In the 16th Report of the Ontario Ent. Soc., Mr. Bowles quotes me as whipping trees and taking the *Catocalæ* that fly up in a net. They should be taken by placing the mouth of the poison bottle over them when they settle on the same or another tree. Taking in a net spoils them. While on this subject, I might add that I seldom capture females on trees in the afternoon, while half of those taken at sugar are likely to be females. Can any one say where the females are during the day time?

It is generally understood that *Catocalæ* are to be found on trees in the afternoons if the wind blows from the south or southwest. I find that during extreme dry weather the direction of the wind makes little or no difference.

ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN LEPIDOPTERA.

BY AUG. R. GROTE, A. M.

In the preparation of the present paper I have used articles by myself which have appeared in the "Popular Science Monthly," in the pages of "Silliman's Journal," and elsewhere. I have also noticed what has been printed bearing on the subject by other writers. I have tried to present the whole subject as it now appears to me, at the risk of repeating myself in part. This seemed at times excusable if not unavoidable, but as it is

my own writings that I have chiefly borrowed from, the use of quotation marks is unnecessary, the more so as I have here gone freshly over the subject, digesting my previous observations and adding new ones before preparing the present chapter in a history of our North American Lepidoptera. Some of my views, as here stated, were put forth in a lecture I held in 1885, before the Bremen "Naturwissenschaftlichen Verein." I shall be glad if this paper adds to the interest naturally evoked by this field of study in Natural History.

It is a curious thought that our butterflies and moths have very probably remained unchanged, to any great extent, for real æons of time. These little fringes to the great web of animal life have withstood the tooth of time, while the pattern itself has been frayed out in places and replaced. It is not unlikely that our *Libythea Bachmanii** itself may have sported about the now long extinct Mastodon, alighting on the huge back of this great beast as it sunned itself by summer pools in the willow-hedged meadows and low lands. At the close of the Tertiary we have evidence that our butterflies and moths were much the same as they are to-day—not always the same species, nor the same genera, perhaps; and some of the kinds of these little fluffy ornaments may well have been worn away by the cold and storms of the slowly advancing Ice Period. But the pre-glacial ancestors of the present lepidopterous fauna of the Northern Hemisphere must have greatly resembled their descendants of to-day, while in the ranks of the larger animals great changes were to occur. While in size, structure and appearance these butterflies and moths of the Tertiary probably resembled those of the Quarternary, they were to undergo the vicissitudes of a general change in the climate under which we cannot believe but that they were forced to the South and the great separation of the faunas took place, their former Arctic sporting ground being converted into the frozen wilderness which it is yet so largely to-day. At the opening of the Quarternary the migration commenced to set back, but the conditions of climate under the Tertiary have never

* I chose this species not only on account of the fact that I believe it to be a very ancient form of butterfly, but because I found it very plentiful in Alabama about swampy places on the roadside, from whence the species flew up in numbers to play in the air, some settling on my horse in a particularly fearless manner, allowing me to catch one on the very reins I held in my hand. This species is rare and solitary in New York, and illustrates what I have to say here about the increase in *numbers* of certain species as we go southward.

again obtained and probably will never do so. The first conditions, then, for the presence of a species of Lepidoptera are those of warmth and food—a minimum of cold to be supported, a sufficiently extended time of warmth during which the insect can provide for its metamorphoses. The summers running too short, will prevent the existence of species, even where the food is abundant; while a few kinds of Arctic butterflies seem to take two years in which to perform their life changes, an acquired habit with the other phenomena of hibernation. In this respect there is a difference of hardiness between the species; it is probable that the *average* temperature is not of so much consequence as the point of its absolute lowness at given times, exposure to which, in certain of its states, the insect cannot survive. The same amount of cold might be innocuous to the egg, which would kill the chrysalis. That food itself is not sufficient for the presence of the species to which it is adapted, is a fact well known to collectors. While there are a good many accidental causes to account for this, in any one region, it is found also that the range of the plant is not necessarily co-extensive with the range of the species feeding upon it; here the climate (humidity, degree of cold) is one of the determining causes. After warmth and food we must next consider enemies, parasites, competing species. This is a vast field for observation. The number of ichneumon flies is apparently influenced by special causes, so that in some years they do not destroy so many caterpillars; in shifting their ground the lepidopterous hosts sometimes evade their guests for a season. The birds destroy yearly a large percentage of these insects, but they, as well, are more or less plentiful from causes which are independent of the supply of insect food.

There is then to be considered the physical geography and the geology of the country. What are called by Entomologists "Chalk insects," are those species which inhabit by preference this formation, the geology of a district influencing its flora, and this in turn its insects. Forests are also protective to some considerable extent, less from depredators and enemies than from high winds, which tear our frail friends to pieces; and from sudden changes of temperature at an awkward moment, such as the change of dress from the caterpillar to the chrysalis state, or the previous and various steppings out of the larval skin, which, like getting out of one's trousers, is always a risky undertaking. The forest itself may seem to be bare of insects as compared with the open fields, where the broad bits of color of a butterfly's wings come into quick notice. But, in

reality, the edges of the woods are usually, and the interior quite often, where not too dark, the haunting place of these hamadryads where they escape notice for a time, while the moths, which I here especially discuss, are fond of these quieter dusky places in the daytime.

To understand the way in which our species of North American Moths are distributed (and by North American we mean those inhabiting the territory north of Mexico and the West Indies) we must then study the physical geography of the continent. There are a host of species which for the most part depend on special kinds of plants, and their diffusion is in this way limited by the range of the plants upon which their caterpillars subsist. The botany of a region is, to this extent, an index to its entomology. But, from their greater activity, these flying flowers, the Moths, range on occasion out of the way of the plants upon which they have fed in their young stages. If we take a map giving a bird's-eye view of the continent, with the elevations marked, we can understand the problem better. Ranges of mountains obstruct, valleys and river channels assist the dispersion of Moths. They travel on the wings of the wind, and an important factor in their range is the prevailing seasonal direction of the air-currents. There is, in North America, a summer migration of many species from the South to the North, aided by the prevailing winds, so that, towards the Fall, several tropical kinds have followed for long distances the coast line, or up the valley of the Mississippi. The Cotton-worm Moth, which, in its caterpillar state, inflicts great damages upon the plantations, is a case in point. If the direction of the prevailing winds in early summer from South to North were reversed, the Cotton Worm would not come up North. I have noticed that its advent along the coast was retarded by contrary or no strong winds. This seems to be the view held by planters along the coast of Georgia. Individual specimens or flocks of other moths, such as the Great Owlet, *N. Agrippina*, the Blue and Green Hawk, *Argens Labruscae*, visit us yearly, coming up from the West Indies, with other of the larger stronger-winged Sphingidæ and Noctuidæ. They die out in the winter and leave no progeny behind to continue the species the ensuing spring. But many kinds have effectually colonized themselves in South Florida, and there is probably an irregular line of successful hibernation for all these foreigners, including the Cotton-worm Moth, to be drawn through the Southern States. It is, then, clear that the provisions of Nature for the sustenance of these animals render a certain exertion necessary on the part of the Butterflies

and Moths themselves, to partake of them. This exertion it is which, in its results, assists in the formation of distinct species. To get their food, rest, protection, etc., a certain amount of work has to be done, and to do this work to the best advantage the functional systems are impressed. The food even of a caterpillar does not fall into its mouth. With all their apparent helplessness when discovered, it is only necessary to consider how difficult it is generally to find these helpless beings which exert themselves constantly to avoid observation from their enemies. Insects as well as man have probably much to learn, and are probably learning after their peculiar fashion every day. In particular I have been struck with the conscious way in which insects seem to provide for their escape from observation. They become rigid in their efforts to keep still. I do not think, however, that the "death mimicry" is a tenable theory. It is by the *keeping still* that the insects seem to me to appear to "feign death," of the existence of which latter they could have no knowledge. Hard-shelled beetles readily tumble to the ground, not caring for the fall, but soft-skinned caterpillars cling tenaciously. They seem to know that they cannot support the shock of a fall, the practical result of which accident I have often observed by finding dead Sphinx larvæ on the sidewalks after a storm which had blown them from their perches. Hairy caterpillars stick less closely than naked ones, relying on their bristles to act as buffers, and coiling themselves so as to shield the head, legs and under surface.

Rivers assist in the dispersion of insects, and in a less degree, perhaps the particular insects we are now discussing. Nevertheless, upon leaves and sticks the eggs of moths are floated on the current, while the commerce of the water routes and the great ocean itself brings eggs and pupæ with the vegetables and fruits which are carried from place to place in boats and ships. In this way the White Cabbage Butterfly has been introduced from Europe, and probably the Currant Borer, *Aegeria Tipuliformis*. A bird's-eye view of the continent of North America shows us the elevations of the Rocky Mountains and parallel spurs in the West and the Alleghanies in the East. These mountain ranges stand in the way of the spreading of Moths, which perish in the cold atmosphere and the storms which gather about their rocky summits. Our faunæ can be best appreciated by studying the elevation of the land above the level of the sea. Over the vast plains east of Colorado, the same kinds of Moths generally prevail. The canons and valleys of the West, on the other

hand, contain everywhere peculiar varieties and kinds often more local than in the East. In New York we are cut off again from several kinds plentiful in Ohio and Indiana. Our tropical wanderers come to us up and along the coast. I have met, sailing along the Gulf Stream, flights of moths, mostly of one and the same species, which fell on the rigging and sides of the vessel in numbers. In the autumn, on Staten Island, I have captured many Owlet Moths whose true home is the West Indies, such as *Perigea Epopea*, *Aletia Argillacea*, *Anomis Erosa*. The light houses on the coast attract many moths, and here specimens of *Euthisanotia Tinais*, the Spanish Moth, are not unfrequent in the late summer; this species breeds in South Florida, as discovered by my friend, Mr. Roland Thaxter.

Although smaller faunæ, limits of particular species, may be traced over the entire eastern portion of the continent, our mountain ranges are the best guide as to changes of a more general character in the Moths. When we get to the Rocky Mountain region we part with most of the Eastern species, though a few traverse the entire continent from East to West. As a whole the Californian and Western fauna resembles the European more than the Eastern. In the Butterflies this is seen in the more numerous kinds of Meadow Browns and the presence of a species of *Papilio* which greatly resembles the common European *P. Machaon*. In the Moths we have such genera as *Nemeophila* not found in the East; while, conversely, in the East we have Mexican, or South American forms, which do not seem to ascend the coast on the west side of the Rocky Mountains, such as the genus *Citheronia*. These and other facts lead me to a study of the origin of our various structural types of Moths, and the conclusion that we have three proximate sources for our fauna: 1. Descendants from a former Northern fauna, which in the Tertiary obtained in Northern Europe, Asia and America; 2. Immigrants and descendants of a migration from the South which is still going on; 3. Descendants of a former fauna, proper to North America itself and surviving the Glacial Epoch. An attempt to sort the genera of the family Sphingidæ under these three headings will be found in the pages of the American Journal of Science and Arts.

So true it is that one branch of a subject leads us to questions and matters quite foreign to the immediate enquiry, that here the subject of the geographical range of North American Moths leads us into myth and poetry. For, in finding out that we have species of moths closely related to or identical with some found on other quarters of the globe, the ques-

tion arises at once, How did they get here? They could not fly over from Europe, nor could they cross Behrings Straits with the cold climate there existing in recent times. We have historic evidence of the importation of but one or two species. We may surmise that others have at different times made their way across through commerce. I conjecture this may be the case with the Boll Worm and other species of the genus *Heliothis*. I think that the Cabbage *Plusia*, *P. Ni* of Hübner, is likewise an imported species. This latter insect is characterized by curious abdominal tuftings, which no other species of the genus shares; it is, in my opinion, its strongest specific character, and it is an absurdity to make a different species out of the American specimens (which have the same tufting as the European) on the strength of some infinitesimal differences, which, small as they are, are not even well made out to be constant. Much greater differences are exhibited by the American specimens of the Boll Worm; the race which I have called *umbrosus* being larger, paler, more greenish or olive tinted than the European, but other specimens occur also equally of a dirty ochrey, and undoubtedly equivalent to the European. It is the case also with the Cabbage Butterfly, that a sulphur colored variety, which has rarely been found in England, is not unfrequent in America, and for aught I know the form *umbrosus* may also occur in Europe, where, on the whole, this species of *Heliothis* is rare. The genus *Pyrrhia* resembles *Heliothis* in general structure, but differs decidedly generically by the tibiae being unarmed, without spines or claws; the thorax is closely and thickly haired with a slight longitudinal crest; the face between the eyes is smooth, elevated. The wings are pointed at the tips, and the colors are peculiar, light yellow and dark orange red. We have in our fauna a species with rusty reddish yellow fore wings, crossed by darker lines, which is described by Walker as *Exprimens*, but is undoubtedly equivalent to the European *P. Marginata* Fabr. We have then a second form, not found in Europe, occurring in the Middle and Eastern States and Canada, *P. Angulata* Grote (= *P. exprimens* Speyer nec Walk.) Besides these two Eastern species we have a third, *P. stilla* Grote, found by Prof. Snow in Colorado, which has the fore wings of a bright orange red, smooth, evenly colored; the usual stigmata are wanting; the deep brown even median shade forms a band, acutely angulated on cell, strongly contrasting, diffuse outwardly; fringes with a bright red tint. The hind wings of this highly colored, lovely species, are light yellow, with a blackish lunule, blackish at base and with

a vague terminal blackish band tinged with red outwardly. Beneath yellow; the fringes on primaries red; red exterior bands and discal marks. This perfectly distinct species I have fully described in the pages of the North American Entomologist, 45. Here it is evident that a separation into several species has resulted from the isolation of the American original stock, unless we consider the form *marginata* to have been imported by commerce, of which we have no historical data, but yet which may have well happened. Not only *H. Armiger*, but I now believe the other European species of *Heliothis*, viz., *Dipsacea* and its variety *Maritima*, with yellow secondaries, and *Scutosus*, also occur in America, where I have given them other names when first discovered, not having European specimens at hand to compare, and also under the impression, which was first, I think, disseminated among us by Agassiz, that the European and North American species were distinct as a whole, and that the forms which resembled each other were "representative species." There is then a class of *identical* species of moths which have been probably disseminated by commerce, such as the above species of *Plusia* and *Heliothis*, the Codling Moth, *Carpocapsa Pomonella*, the Clothes Moths, *Tinea* and *Tineola*. But there are other *identical* species which have evidently *not* been so distributed. An example of this class is *Scoliopteryx Libatrix*, the Drinker Moth, which is found very far north in Hudson's Bay Territory, and occurs on the Atlantic coast at least as far south as Virginia. We then find species which, if found side by side with the type in Europe, would hardly be considered distinct; but, since the American specimens show a slight character in all stages, they may be held correctly to have attained the rank of species. Such species as *Apatela occidentalis*, *Hadena finitima*, *Hyppa xylinoides*, *Mamestra atlantica*, among the Noctuidæ, *Deilephila Chamaenerii* among the Hawk Moths, *Clisiocampa Americana* among the Spinners, fall under this category. In fact, as I have shown, there is an ascending scale of differences increasing in obviousness and importance until we arrive at what appear to me to be perfectly distinct species. In a number of different papers, published in various scientific journals since 1873, I have adduced facts bearing on the identity and difference of our species with European forms, and illustrating the existence of this element in the North American fauna. The latest and most interesting discovery made by me is that of a species inhabiting Arizona and allied to the European *Mamestra Brassicae* of Authors. This species and the European constitute, in my

opinion, a distinct genus from the presence of a claw on the front tibiae ; the species have hairy eyes and otherwise generally agree with the very numerous forms of the genus *Mamestra*. I have called the new genus *Copimamestra*, and described our Western species as *C. Occidenta*. So wide a geographical separation as that of these two species, which, in structure as well as markings, agree so closely, must have a deeper reason and in my opinion points conclusively to a former common habitat which has become disturbed by climatic and geologic change.

We shall have to leave Entomology and go back into past geologic epochs to explain the existence in our North American moth fauna of this large number of forms with varying European affinities. Imaginative persons have supposed the existence in former times of an Atlantic continent now submerged and which bridged the chasm of the waves. The myth of the Atlantis has been refurbished anew and on an immense scale by certain writers under the inducement of the facts supplied by the discovery of a plateau at the bottom of the Atlantic Ocean by the soundings of H. M. S. Challenger, in its famous voyage of oceanic discovery around the world.*

It is sure that there was formerly a warm climate in the arctic zones during the Tertiary and preceding geological age. This was a certain measurable time ago, when the circumpolar regions had a warm average temperature, with no winter, and the probable identity of the fauna ex-

* I print here the following note received from the lamented Naturalist, R. von Willemoes-Suhm, after whom I named the now well known genus of eyeless Crustacea (found in the Atlantic at great depths by the Expedition) :—

“Challenger, Yeddo, May 7th, 1875.

“MY DEAR PROF. GROTE,—

“There can be no doubt, I think, that Prof. Thompson will allow me to put aside specimens of *Willemoesia* when we come back to Europe. Just now they are all packed away and sent home, where the bottles remain unopened until we come back, which will be in about a year's time, and I shall then be very happy in sending you the desired Crustaceans.

I am, with great respect, your obed't serv't,

“(Signed) R. VON WILLEMOES-SUHM.

“TO PROF. AUG. RADCLIFFE GROTE, Buffalo, N. Y.”

This was the second and last note that I received from this enterprising Naturalist, who died on board the Challenger shortly after, and before the ship left the Japanese waters. So we may hope to get safely back home from our journeys and never see it again !

tending from Scandinavia, across Siberia to Greenland. During this time we must imagine that no impediment existed to the migrations of animals, and, among them, insects, across what is now Behring's Straits. Were this narrow channel then existing, it could be easily crossed by the flight of almost any Moth, and of itself could make no effective barrier against a constant interchange of species.

It is probable that the Tertiary, as it witnessed the first appearance of Man, saw also his first wanderings in North America. He, too, came from Asia by way of the North and the Strait. Evolution had performed surprising work in the meanwhile with one branch of the human family, members of which sailing to the West and landing from Scandinavian or Spanish ships, met, upon American soil, the descendants of a migration from Asia to America in a former geological period, and to the East! At the close of this Tertiary period of the earth's history, cold and snow and ice set in; the long winter of the ages made its appearance in the shape of the Glacial Epoch. The circumpolar Moths, whose more humble fortunes we must be content here alone to follow, were forced gradually southward by the change in climate which gathered its frigid strength in the North. The European, Asiatic and American faunæ then became separated, the latter the most completely, and by barriers both of ice and ocean. The American species of Moths which formerly lived by the Arctic Ocean, were gradually forced downwards to the South, year by year, until they reached Mexico or the then elevated portions of the Southern States. When the ice sheet melted and slowly drained away through the valleys and water channels of a continent awakening for the first time to a Spring and released from a Winter of the Years, the Moths, modified as to species in the long conflict with the climate, retraced their way to the North. As marks of this retreat and return, colonies of Butterflies and Moths were left on the mountains to tell of the flood. On the White Mountains we find to-day the White Mountain Butterfly, *Oeneis Semidea*, and the Arctic Lappet Moth, *Laria Rossii*.* At this time the Western Clawed Cut-worm, *Copimamestra Occidentia*, had become permanently separated from what is now the European *C. Brassicae*, and the differences which separate the two to-day as distinct species are the result

* See a number of papers on this subject, in particular my original communication read before the American Association for the Advancement of Science, August, 1875, and an article entitled "A Colony of Butterflies," originally printed in the *American Naturalist*.

of the action of the total environment upon what was once the same undistinguishable form. The element in our Moths which has its affinity with the European and Siberian fauna, must be traced back to the time when the species were throughout the same and inhabited a common territory.

Let us turn back to the other theory, that of a submerged Atlantic Continent. Whatever may be finally proven by geology as to the existence of such an Atlantic bridge, it is clear that the myth of the *Atlantis*, cited to support the theory, must be separated from such facts as being of recent and even historic origin. Primitive Man existed æons before the notions which were worked into the poetic and semi-historical myth of the Hesperides and Atlantides. The setting sun was followed by human eyes for untold ages, as it bathed itself in the golden flush of evening and sank behind the purple veil of clouds into an ocean whose waters were at first believed to surround the circular, flat earth. The sun was the golden apple of the garden of the Hesperides, the Golden Fleece after which Jason sailed. The poets transformed the primitive notions into charming myths, which probably had their origin in the observation of low-lying clouds, floating, like islands, in a sun-flushed western sky. In this region of conjecture and romance it is excusable to take to rhyme :

ATLANTIS.

The western sky is all ablaze,
And, floating on that golden sea,
The clouds, like islands in a maze,
Blest dwelling-places seem to be.

When first this sight was viewed by man,
He thought the earth was flat, not round ;
That all about its rim there ran
An ocean which the land did bound.

The poet in those early days
Immortalized the sun-flushed seas ;
He peopled those far slopes and bays,
And called the isles Atlantides.

And so the legend grew until
The clouds in evening's dreamy light,
With which the poet showed his skill,
Had vanished from the mental sight ;

Instead, the story true appeared
And every sailor did his best,
While straight from port the vessels steered
For those far islands in the west.

But none returned of all who went,
Who sight of those fair islands caught,
Through the white waves the tempest sent
The barks which shattered home were brought.

And some returned no more—but these
Were fabled to have reached the strand,
Where, anchored in luxurious ease,
Their ships will never leave the land ;

The crews lie on those sunny slopes,
Purple with fruit, with vintage blest ;
The ships are held by flowery ropes
In sleepy bays content to rest.

The poet steps into his boat,
The sunset makes his starting fair,
Through the long night with Death he'll float,
And in the morning he'll be there.

The study of the geographical distribution of our Moths has led us a long way back in the history of our race and the birth of our ideas. We have now somewhat briefly, but, I hope, clearly, discussed the basis for this first element in our Moth fauna, and I would merely point out that in studying the unequal differences which show themselves between the allied forms, I have found a certain system in the variational characters. These, when compared, are first obvious on the upper surface of the fore wings, then on the upper surface of secondaries, and finally beneath. In other words, this variation follows the exposure of the different surfaces to the air and light, the moths resting chiefly by daylight with the primaries more or less deflexed and their upper surfaces exposed, covering the hind wings. An instance in point is the White Underwing, *Catocala Relicta*, an insect which has a certain range of variation in the general color of the fore wings, which are sufficiently unlike those of its near European ally, the Blue Underwing, *Catocala Fraxini*. The upper surface of the hind wings is very much like that of the European species, except that the narrow median band is *white*, not dusky *blue*. But I have originally

shown,* and my statement has been copied by later Entomologists, that in some specimens of our species the band shows blue scales on the edges, evidently a trace of a former greater resemblance between the two, on the under surface yet very similar species.

The second element in our Moth fauna is that which is South American or intertropical in its character. In the Hawk Moths such genera as *Aellopos*, *Enyo*, *Cautethia*, *Philampelus*, must be reckoned as such, while in this category we must distinguish between those forms of recent and partial or more ancient and entire acclimatization in the United States and Canada. As coming under the latter head we may reckon the genera *Citheronia* and *Eacles* among our larger Moths which enjoy a much greater representation in species in Mexico and South America.

The final element of peculiarly North American genera is a large one and in every family of Moths has abundant representation. In the Hawk Moths *Arctonotus*, *Lepisesia*, *Deidamia*, *Everyx* and *Cressonia* are instances; both the Spinners and the Owlet Moths have numerous examples of this category.

(To be Continued.)

A NEW PHYTOPTOCERIDIUM FROM NORTH AMERICA, ON ACHILLEA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

In the middle of September, 1886, Prof. W. G. Farlow sent to me several specimens of the heads of *Achillea* (probably *A. millefolium* L.) collected on Mt. Washington. They correspond well with the deformity described by Dr. Fr. Thomas in Giebel's *Zeitschr.*, 1872, vol. 39, p. 464, on *A. moschata* Wulf. The flowers are to a large part changed in white hairy sacs or galls, containing a number of living *Phytoptas*. As far as

* In the CANADIAN ENTOMOLOGIST, vol. vii., p. 186; also *Ann. Lyc. Nat. Hist. N. Y.*, xi., p. 301, 1876, where I show that certain writers are at fault in considering the variation in the color of primaries in this prominent species as sexual, the whitest examples being given as the males; consult also an article in the CANADIAN ENTOMOLOGIST entitled: "On Species of *Catocala*," pp. 229-232.

known to me, this gall is not yet described from the U. S., and is very similar to those of *A. millefolium* described by Mr. Fr. Loew, Verhdl. Wien. Z. B. Ges., 1878, vol. 28, p. 130, which is to be found in Baron Thuemen Herbar. mycolog. oeconom. Suppl., I., No. 60. Our collection possesses a specimen by Prof. Thomas with the indication of *Tylenchus* (*Anguillula*) *millefolii* Loew. At first I believed to see also in Prof. Farlow's specimens, besides the Phytoptas, some *Anguillula*. But the polarised light showed directly that I had mistaken some fragments of the fine white hairs for *Anguillula*; the polarised light would have shown directly the muscular apparatus in the *Anguillula*. It is nevertheless probable that other plants of *Achillea* may contain the *Tylenchus*. I believe that the galls before me may have contained before a Cecidomyia, though the European species is not yet recorded from the U. S. As *Achillea millefolium* is common in the north of the U. S., I desire to draw the attention of Entomologists to this plant. The European literature on the parasites of *A. millefolium* is somewhat large.

ENTOMOLOGICAL CLUB, A. A. A. S.

The Club met at Buffalo, N. Y., on August 17, 1886, at the rooms of the Buffalo Society of Natural History, 14 members being present.

The session continued at intervals during the meeting of the A. A. A. S. The following persons were in attendance during the meeting: J. A. Lintner, Albany, N. Y.; J. H. Comstock, Ithaca, N. Y.; S. A. Forbes, Champagne, Ill.; L. M. Underwood, Syracuse, N. Y.; T. B. Stowell, Courtland, Ill.; Rev. R. Benjamin, Cincinnati, O.; E. W. Claypole, Akron, O.; Dr. J. B. Tweedale, St. Thomas, Ont.; D. S. Kellicott, E. M. Chamot, O. Reinecke, C. D. Zimmerman, Ph. Fischer, E. P. Van Duzee, Buffalo.

The Entomological Society of Ontario was duly represented by Mr. Wm. Saunders, Rev. C. J. S. Bethune, Mr. J. Alston Moffat, and Mr. E. Baynes Reed.

The President, Prof. J. A. Lintner, took the chair, and Mr. E. B. Reed acted as Secretary in the absence of Mr. J. B. Smith, of Washington.

The President gave his annual address, which was a very able review of the progress of Entomology, as shown in publications which have appeared since the last meeting.

Prof. Lintner also alluded to the absence of some who were usually attendant at the Club meetings, referring especially to Prof. C. V. Riley, who was then in Europe for the benefit of his health.

Dr. D. S. Kellicott, on behalf of the Buffalo Society of Natural History, placed the rooms at the disposal of the members of the Club.

The President paid a high compliment to the contributions to Entomology that had emanated from the rooms where they were meeting.

Prof. Comstock explained a new method of arranging collections by which loss of time is avoided in transferring specimens so as to make room for additional species, or making necessary changes in their arrangement. The main feature of this plan consists in having movable blocks on which the insects are pinned, but made in sections to fit the cases.

The following officers were elected for the ensuing year :—

President	-	Prof. J. H. Comstock	-	Ithaca, N. Y.
Vice-do	-	Prof. S. A. Forbes	-	Champaigne, Ill.
Secretary	-	Mr. E. Baynes Reed	-	London, Ont.

The following is a summary of papers read before the meeting during the session :—

Prof. S. A. Forbes—Notes of the Past Year's Work: The Hessian Fly, *Cecidomyia destructor*, has been found to hibernate in Southern Illinois as a naked white grub, not forming puparium until May following, and emerging before harvest; these are probably the offspring of a mid-summer brood, which develop in volunteer wheat. The Clover Seed Midge, *C. leguminicola*, was observed first in 1879 in Illinois. A new Chalcid parasite, *Tetrastichus*, has been reported, but its worst enemy so far observed was *Triphleps insidiosus*. The young of this species are often so abundant on the clover heads as to be mistaken for the injurious midge, but a little observation will show their beneficial character. The Wheat-stem Maggot, *Meromyza Americana*, is shown to have three broods instead of two only. Eggs and half-grown larvæ were found in abundance, August 4th. Two species of *Melanotus*, *communis* and *cribulosus*, were bred to maturity, and a third Elaterid not yet determined, of which figures and precise descriptions have been prepared. Larvæ of these, and of *Agriotes mancus*, and of a *Cardiophorus*, were reported as injurious to

Indian corn, the peculiar larvæ of the last boring the roots in all directions in sandy soil. *M. cribulosus* pupates in July and forms imago in September. The Corn-root Worm, *Diabrotica longicornis*, is reported as seriously affecting crops in Southern Illinois. The common pale Flea Beetle, *Systema blanda*, was bred from larvæ feeding on kernels of sprouting corn in the earth. *Epicærus imbricator* taken feeding on leaves of pear; eggs laid in single layer on leaves, concealed by the insect fastening together the opposed surfaces of the leaves. Larva of *Sphenophorus parvulus* found to infest the roots of meadow grass (timothy). The midge sucks the sap from stems of wheat and corn. The Corn-plant Louse, *Aphis maidis*, was very injurious; observation shows that they are strictly dependent on the ant, *Lasius alienus*, which mines along the principal roots, collects the plant lice and conveys them into these burrows and there watches over and protects them. The ants have nothing to do with the hibernation of the lice, their winter nests never containing them in any form, either in corn-fields or other situations; the facts indicate that the lice hibernate as wingless females on the earth of fields previously infested. The Currant Worm, *Nematus ventricosus*, was mentioned as a case of retarded development. Mr. Bethune had noticed a similar case in *Attacus promethea*. The Root Web-worm, *Crambus zeellus*, was very destructive to corn in Illinois. A detailed description was given of its earth nest and the method and character of injury done to corn by this species. It hibernates as a larva, pupates in a tubular nest in June, emerging June and July.

A paper was read from H. Garman: Contribution to Life History of, *Aphis maidis*.

Paper read from W. L. Deveraux: A Dangerless Insecticide for Collecting Bottles. The best vegetable container of prussic acid is the bark of the wild cherry, *Prunus serotina*, to be used for the Serotina bottle for young collectors, like the Laurel bottle of European entomologists.

In the discussions that took place,

Prof. Forbes stated that the attacks of *myrmis* had considerably lessened the number of grasshoppers in Illinois.

The President called attention to the unusual number of Aphides in New York State. They had been found on apple, black currant, tomato, and on potato in the Eastern States. The hop crop was almost destroyed by them in New York.

Mr. Bethune had also found them very numerous on the north shore of Lake Ontario.

In reply to a question, Prof. Lintner stated that European entomologists had come to the conclusion that the Aphis of the wild cherry and of the hop were identical.

Mr. Fischer called attention to the probable identity of *Spilosoma fuliginosa* and *rubricosa*. He also exhibited a specimen of *Catocala obscura* just taken by him for the first time in Buffalo.

The President called attention to the fact of the earth worm being the host of a parasite, and therefore dangerous to fowls and poultry.

An excursion of members of the Club took place to Ebenezer, where a very pleasant afternoon was spent, and some interesting captures were made, among the most interesting being *Cicindela ancocisconensis*.

The Club adjourned to the call of the President at the next meeting of the Association.

THE HIGHEST ELEVATION FOR NEUROPTERA IN THE UNITED STATES.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

Mr. H. W. Turner, U. S. Geol. Survey, San Francisco, Cal., has sent to me Phryganid cases from Mt. Conness, Mono Co., living in water at an altitude of over 10,500 feet. They are 15 m. m. long, the front half made by irregular small bits of stones, the apical half of short bits of pine leaves, and the case being narrower; around the case are placed longer parts of pine leaves or grasses in a herring-bone fashion. A few dry larvæ and the shape and arrangement of the cases show them to belong to the family of Limnophilidæ, and to the group of Hallisus.

Other cases were collected from a small lake on the north side of Mt. Dana, at an altitude of over 11,500 ft. These cases are smaller, 10 m. m. long, of little bits of mica and other stones, more cylindrical, sloping a little to the end. They seem to belong to the family of Sericostomidæ, which is at least not contradicted by some remnants of dry larvæ.

At the same place were collected a few sub-imagoes of Ephemerina, probably belonging to the group of Potamanthus; wings and body are blackish.

As far as I know, this is the highest elevation in the U. S. from which Phryganid larvae and Ephemerina are reported to live. From South America I have Phryganid cases out of Lake Titicaca.

CORRESPONDENCE.

Dear Sir : In the July No. of the CANADIAN ENTOMOLOGIST for this year, is a list of the North American Sphingidæ, by A. R. Grote, A. M., in which, amongst other valuable matter, there is a paragraph which reads thus: "We have in South Florida a West Indian colony, the extent of which is not yet known. Stragglers from the south, as *Ello*, *Titan*, *Labruscæ*, invade even New England. How far north these breed with us is not known. They seem hardly to belong to the North American fauna, but are all included here so far as they have been reported to me as being taken within the political limits of the United States." I have now to report that *Dilophonota Ello* Linn. has reached this locality, four specimens having been taken this fall, three by Mr. Johnston in the city, and one by Mr. Kyle in Dundas. Mr. Grote's remarks seem naturally to suggest the question, Did these specimens fly to us from a distance, or were they bred here? If they were bred in this locality, then the next thing in order will be information about its food plant. It seems to appear somewhat late in the season, one being taken on 1st of October.

In June last I took a beetle seldom seen in Canadian collections, *Anthophila viridis* Lec., which I identified by a specimen in the fine collection of Mr. Reinecke, of Buffalo, the attractive, sparkling golden-green of its elytra giving it far more the appearance of a South American species, than one to be got in the North. Some information about its habits would be very acceptable. I captured my specimen on the wing.

J. ALSTON MOFFAT.

A RARE MOTH.

On the 23rd of August last, I had the gratification of capturing a female *Erebus odora* at Niagara Falls, Ont. The specimen, which was fresh and perfect, evidently just emerged from the chrysalis, was resting on an awning close to an electric light, on the verandah of the Clifton House. It was about 11 p. m. when I made the capture; the evening was warm, and a gentle rain had been falling for some hours. Close to it I also obtained a beautiful specimen of *Catocala relictæ*, a moth that I have rarely taken of late years.

C. J. S. BETHUNE, Port Hope.

A few days ago Professor Ropes, Andover, Mass., had the kindness to show me the library of the Theological Seminary. The books of the library, i. e., the back of the binding, as the Professor wrote to me some time ago, are injured to a very large extent by *Lepisma*. Most of the bindings were from Germany, covered with varnished paper, but some bindings were from England and from the U. S. Some loose sheets of printed paper are eaten on the margins and have many holes besides. The Professor believes that Turkish-Morocco bindings stand best against these pests.

H. A. HAGEN, Cambridge, Mass.

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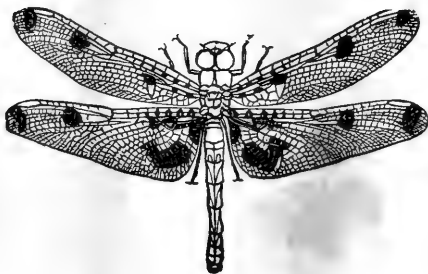
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VOL. XVIII.

LONDON, OCTOBER, 1886.

No. 10

EDITORIAL.

It will be with deep regret, we are sure, that the readers of THE CANADIAN ENTOMOLOGIST will receive the information that MR. SAUNDERS, who has for so many years so ably filled the position of Editor of this magazine, has felt himself obliged to resign for the present all active connection with it. His resignation has been occasioned by his appointment to the important and arduous office of Director of the Experimental Farm Stations of the Dominion.

For some time last year Mr. Saunders was engaged in visiting many of the Agricultural Colleges and Experimental Farms in the United States, and prepared an exhaustive report upon his observations, which was laid before the Dominion Parliament at its last session, and received the highest commendation. During the present year he visited England in charge of the Canadian fruit display at the Colonial and Indian Exhibition in London, and since his return he undertook and carried out successfully the experiment of shipping to England a large variety of fruits and vegetables in special refrigerators, constructed under his direction in two of the principal ocean steamships sailing from Montreal. These multiform occupations, involving almost constant absence from home, while they attest the versatility of Mr. Saunders' powers, will account to our readers for the occasional want of punctuality in the issues of this magazine during the last twelve-month.

With regard to his fitness for his new position, we may quote an extract from the Ottawa correspondence of the London *Free Press* :

"Mr. Saunders is a gentleman singularly well qualified for the position to which the Government has appointed him. He was for years President of the Ontario Fruit Growers' Association—a position which he held by reason of his superior knowledge of all that appertains to the cultivation of fruit. He is recognized as one of the leading chemists of the Dominion, and was at one time one of the chief officers of the American Association for the Advancement of Science. He has been for years the

leading entomologist of the Dominion, and to that branch of natural science has made many valuable literary contributions. He is a member of the Executive Board in charge of the Provincial Agricultural College at Guelph—a position which shows in some degree the extent to which his knowledge of scientific agriculture is recognized by the Ontario Government. He has, to an extent more generally perhaps than any other man in the Dominion, conducted delicate experiments of an agricultural character, and in assuming the directorship of the new farm stations will be following in the groove to which his efforts and education have for years tended. He also combines with rare executive ability the faculty of intelligently communicating his ideas to others. Just such a man was wanted."

Having enjoyed the privilege of Mr. Saunders' friendship for close upon five and twenty years, we feel that the above description does not express one half his merits. Taking him all round, we know of no one who possesses such an accurate knowledge of various departments of science, for instance, Entomology, Botany, practical Chemistry, etc.—of fruit culture, embracing the scientific work of hybridization—of finance,—in fact, in all that he takes up he speedily becomes *facile princeps*; and with it all he has a geniality of character and a kindness of heart that win for him hosts of affectionate friends wherever he goes. While we regret his loss to our Entomological Society—a temporary one, we trust—we cannot but congratulate the Dominion upon the possession of a man who is so well qualified in every way for the important work of organizing and directing its Experimental Farm Stations.

At the request of Mr. Saunders, as well as of other members of our Society, we have consented, with much hesitation, to endeavor to fill the vacant chair of Editor of THE CANADIAN ENTOMOLOGIST. We only venture to resume this work, after a lapse of thirteen years, in full reliance upon the kind consideration and the hearty co-operation of all our old friends—of all, indeed, who are interested in the welfare of this magazine, and in the extension of a knowledge of our special department of science. We have already received so many cheering letters and so many valuable and interesting contributions from leading entomologists in this country and the United States, that we feel very hopefully confident that the reputation and usefulness of our journal will be sustained in the future as in the past.

Not to trespass further upon the patience of our readers, we have now to request that all communications for THE CANADIAN ENTOMOLOGIST should be addressed to the Editor,

REV. C. J. S. BETHUNE,
Trinity College School, Port Hope, Ontario.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the Society was held pursuant to notice at the Society's rooms, London, Ontario, on Wednesday, October 20, 1886, at 8 o'clock.

The Vice-President, Rev. C. J. S. Bethune, M. A., of Port Hope, in the chair.

Present: Mr. James Fletcher, Ottawa; Mr. J. Alston Moffatt, Hamilton; Rev. Thos. W. Fyles, South Quebec; Mr. A. W. Hanham, Hamilton; Capt. Gamble Geddes, Toronto; Dr. J. R. White, Toronto; Mr. J. M. Denton, Mr. J. Bowman, Dr. Burgess, Dr. Arnott, Dr. Woolverton, Mr. H. P. Bock, Mr. Laurence Reed, Mr. Werner, Dr. Wishart, Dr. Mitchell, of London, and the Secretary-Treasurer, Mr. E. Baynes Reed.

The minutes of the previous meeting having been printed and circulated among the members, their reading was dispensed with, and they were duly confirmed.

The Secretary read a letter from the President, Professor Saunders, regretting his inability to be present at the meeting, and stating that he would be unable to continue in active participation in the work of the Society, or to act as Editor of THE CANADIAN ENTOMOLOGIST, inasmuch as he had accepted the Government appointment of Director of the Experimental Farm Stations, and consequently the whole of his time would necessarily be fully occupied.

The report of the Council, the audited financial statement of the Secretary-Treasurer, the report of the Librarian, the report of the Delegate to the Royal Society of Canada, and the report of the Delegates to the American Association for the Advancement of Science, were laid before the meeting, and on motion duly received, discussed and adopted.

These reports will appear as usual in the Society's Annual Report to the Ontario Government.

The report of the Montreal Branch was read by the Secretary, and was ordered to be printed in the Annual Report.

In the absence of the President, his annual address was read by the Secretary.

ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

GENTLEMEN,—

It is seldom that a season passes in Canada with so little to record in reference to the injuries caused by destructive insects. Not only have we been favored by a kind Providence with a bountiful harvest, but our farmers have been free in great measure from the losses which usually occur from insect pests.

The Colorado Potato Beetle, *Doryphora decem-lineata*, has proved destructive to potato vines in a few localities, and where the application of the usual remedies has been neglected or too long delayed, they have destroyed the foliage to such an extent as to injure the crop; but where the use of Paris green has been promptly resorted to, no difficulty has been experienced in keeping this pernicious insect within due limits.

The Plum Curculio, *Conotrachelus nenuphar*, has been far less prevalent than usual, so that in many instances good crops of plums have been secured even where no efforts have been made to keep the insect in subjection. The plum crop generally has been a good one, and plum culture has consequently received a considerable impetus.

The worm of the Cabbage Butterfly, *Pieris rapæ*, although still plentiful, is no longer the terror to cabbage growers it formerly was, its natural enemies having multiplied to an extent sufficient to keep it within some reasonable degree of subjection. The general immunity which has of late prevailed regarding the Pea Weevil, *Bruchus pisi*, still continues, and pea culture has become more general. Even the Codling Worm, that perennial plague to the apple grower, has been less injurious than usual, so that our apple and pear crops have been freer than common from this obnoxious insect. Indeed there seems to have been a general scarcity of insect life during the past season of which collectors in this department of natural history in Canada generally complain.

Our large and important crops of cereals have been almost entirely free from insect pests, but this experience has not by any means been universal. In the mother country much consternation has been caused of late by the sudden appearance of the Hessian Fly in the wheat fields in considerable force, so that very serious injury has occurred in many quarters. When first noticed, specimens of the infested grain were submitted to Miss Eleanor A. Ormerod, Consulting Entomologist to the Royal Agricultural Society, who at once divined the cause, found the linseed-like chrysalis in the wheat stalks, and promptly suggested the usual remedies for this trouble, advice which, if persistently followed, will no doubt soon reduce the numbers of the insect to about their normal proportion. Mr. Whitehead also has been actively engaged in investigating this important subject and in disseminating information among farmers.

Having been absent in Europe during the spring and early summer months, I have been unable to give the usual attention to Entomological subjects. While in England I had the privilege of seeing several fine collections of insects, but none gave me more pleasure in inspection than that of the immortal Linnæus, the result of whose painstaking work is carefully preserved in the library of the Linnæan Society. Through the kindness of Dr. James Murie, the librarian, I was permitted to inspect this interesting cabinet, where every specimen bears evidence of having been mounted and named by this great master in Natural History. One could not help dwelling in thought on the marvellous progress which has attended the study of natural science since the master mind of this wonderful genius was brought to bear on the simplification of its nomenclature.

Every facility was also afforded me for examining the marvellously complete collections of insects in the natural history department of the British Museum, in Kensington, under the kind guidance of Messrs. Butler and Kirby. Both these gentlemen did all in their power to make my visits to that institution both pleasant and profitable, and showed me many kindnesses which will never be forgotten. The collections of Butterflies here are especially wonderful in their completeness. Take for instance the species composing the genera *Pieris* and *Colias*, and beginning with the plain ground color of white or yellow, one can trace the black bordering of the wings through all the different gradations from the faintest marginal outline to the heaviest and widest bands, and the transi-

tion is so gradual that it is extremely difficult to say where one species ends and another begins.

While passing through the extensive grape-growing regions in the south of France, a sharp eye was kept on the vineyards with the view of detecting evidences of *Phylloxera*. I am pleased to report that I saw but few indications of its presence, and from inquiries made the conclusion was reached, that this insect pest, which a short time ago was so exceedingly destructive to the vine-growing interests, is now doing comparatively little harm. It was the occasion of much regret that the limited time at my disposal would not permit me to visit any of the noted collections of insects to be found in most of the large cities of Europe.

While in London, an opportunity was afforded me which I gladly availed myself of, that of visiting the South Kensington Museum in company with Miss Ormerod, and of inspecting the work of that talented lady as displayed in the cases of insects mounted, and the preparations made by her to illustrate the life history of injurious insects and to depict their ravages, forming a most interesting and complete series of object lessons in this important economic department of entomological science. I was also present at one of the monthly meetings of the Entomological Society of London, where I had the good fortune to meet many entomologists of note, including the venerable Professor Westwood, H. T. Stainton, Esq., Mr. McLachlin and others. All treated the stranger with the greatest possible courtesy and kindness, and at the same time manifested the warmest interest in everything relating to the progress of entomology in Canada.

During the past year there have appeared several important works on economic entomology, prominent among which may be mentioned the reports from the Entomological Bureau of the Department of Agriculture at Washington, under the direction of Prof. C. V. Riley, and the report of Prof. J. A. Lintner, State Entomologist of New York. In both these publications are recorded a number of useful observations and many new facts relating to the life history and habits of the species treated of. Among other important works on entomology may be mentioned the continuation of that magnificent work on the Butterflies of North America by W. H. Edwards, and a volume on the Butterflies of the Eastern States by G. H. French, of Carbondale, Illinois.

At the recent meeting of the Entomological Club of the American

Association for the Advancement of Science, held in Buffalo, New York, our Society was represented by the President, Vice-President, Secretary and Mr. J. Alston Moffat. Our Society was honored in the election of our Secretary, Mr. E. Baynes Reed, to be Secretary of the Club. The local members did all in their power to make the gathering a pleasant one, and, in addition to the ordinary meetings, special entomological excursions took place which were much enjoyed by all. The collections of the several members residing in Buffalo, and the fine library belonging to the Society of Natural Science, were freely opened to the visiting members.

The entomological collections in the American National Museum at Washington, are being rapidly augmented under the energetic direction of the curator, Mr. John B. Smith. The valuable private collections which have been acquired, added to the large amount of material constantly accumulating and being rapidly arranged, have already made it a most valuable collection of reference. In accordance with a request made by the Minister of Agriculture for the Dominion, the valuable collection of our Society was specially prepared for exhibition during last winter, and forwarded early in the spring to the Colonial and Indian Exhibition, in London, where it has been an attractive object to visitors throughout the summer. In the work of preparation, most valuable aid was rendered by one of our esteemed fellow members, Mr. J. Alston Moffat, who devoted many weeks of consecutive labor to this end. Mention should also be made of the valuable aid rendered by our esteemed Secretary-Treasurer, Mr. E. Baynes Reed, and of his son Lawrence, also of a member of our Council, Mr. J. M. Denton, for it is to the combined efforts of these several individuals that our great success has been mainly due.

In bringing these brief remarks to a close, I desire to refer to the pleasure it has given me during many years past to fill, to the best of my ability, the post of honor in which, year after year, you have been pleased to place me. Public duties of an important character which I have recently undertaken, will, from this time forward, necessarily engross all my time, and in case my name should be mentioned again in connection with the position of President, I beg to state frankly that I shall be no longer able to serve you in this capacity. I regret also that I shall be compelled to relinquish the work of editing THE CANADIAN ENTOMOLO-

GIST, a position which I have long filled with much pleasure to myself and, I trust, with some acceptance to the Society. In taking leave of the many kind friends who have rendered so much assistance to our journal by their valued contributions, I would, while sincerely thanking them for past favors, bespeak for my successor a continuance of their kind services.

With many thanks for all past kindnesses, I have the honor to be

Your obedient servant,

WM. SAUNDERS.

Moved by Mr. Fletcher, seconded by Rev. Thos. W. Fyles,

That the Society learns with regret that their esteemed friend, Prof. Saunders, has found it necessary to withdraw from the Presidency of their body, and also from the Editorship of their organ, THE CANADIAN ENTOMOLOGIST; but recognizing the importance of the work Prof. Saunders has been called upon to superintend, and the wisdom of the choice made in him by the Government, it congratulates the Professor upon this recognition of his abilities and zeal in the public service, and respectfully tenders to him a Life Membership in the Society.

The resolution was carried unanimously by a standing vote.

ELECTION OF OFFICERS.

The following named gentlemen were duly elected as officers of the Society for the ensuing year :

President—James Fletcher, Ottawa, Ont.

Vice-President—Rev. C. J. S. Bethune, M. A., Port Hope, Ont.

Sec.-Treas. and Librarian—E. Baynes Reed, London, Ont.

Council—W. H. Harrington, Ottawa; Rev. T. W. Fyles, Quebec; J. Alston Moffat, Hamilton, Ont.; G. J. Bowles, Montreal; J. M. Denton, London, Ont.

Editor CANADIAN ENTOMOLOGIST—Rev. C. J. S. Bethune, Port Hope.

Editing Committee—Wm. Saunders, Ottawa; J. M. Denton, E. Baynes Reed, London, Ont.; Capt. Gamble Geddes and Dr. White, Toronto.

Auditors—W. E. Saunders, H. P. Bock, London.

Delegate to Royal Society—W. H. Harrington, Ottawa.

On motion of Mr. E. B. Reed, seconded by Mr. A. W. Hanham, the Society resolved that all ex-Presidents of the Society be ex-officio members of the Council.

Papers were read on the following subjects :

1. Note on Sawfly Larva, *Hylotoma dulciaria* ; by Rev. T. W. Fyles.
2. On the Stridulation of *Geotrupes Blackburnii* ; by Mr. A. W. Hamham.
3. Notes on the Genus *Colias* ; by Capt. G. Geddes.
4. The Home of *Chionobas jutta* ; by Rev. T. W. Fyles.
5. Notes on Larva of *Mallota posticata* ; by Mr. Laurence Reed.
6. On Destruction of Insects by Electric Light ; by Professor E. W. Claypole.

An interesting letter was also read from Miss Eleanor A. Ormerod, Consulting Entomologist of the Royal Agricultural Society, with information on the recent occurrence of the Hessian Fly in England.

NOTE ON WESTERN SPHINGIDÆ.

BY A. R. GROTE, A. M.

It is one of the pleasures which we older Entomologists alone feel to its full extent, when a well written paper, full of matter, falls under our notice on a favorite subject. Such a pleasure I experienced on receiving the June No. of the "old reliable" CANADIAN ENTOMOLOGIST, and the Rev. W. J. Holland's paper on our Sphingidæ opened before me. Supplementing, as it does in various points, Professor Fernald's valuable pamphlet, it will be welcome to all interested in the beautiful study of our Hawk Moths. Upon these I need not further dwell. I wish here to point out, in reference to the interesting remarks on our Western Sphingidæ, that on page 8 of my "New Check List" I say that I am indebted to Mr. Henry Edwards for various assistance, and that "I have received from the same Entomologist information as to the synonymy of certain Western Sphingidæ." Now the only two which have any synonymy beyond the original name are *Occidentalis* and *Vancouverensis*, and these are the ones meant. In fact the only Western form I ever possessed in my own collection was a specimen of *S. perelegans*, which seemed to me undoubtedly a distinct species, nor have I ever made any study of our Western forms. In my "New Check List" I omitted the use of the dash (—), which I have generally used (following Leconte) in my shorter

lists after species unknown to me in nature. In my paper in July No., the locality, "West Coast," belongs to the preceding species *perelegans*, and a dash should follow *Vancouverensis*, as to the synonymy of which, as well as its validity as a species, I was indebted to Mr. Hy. Edwards for information. As will be seen by the absence of the dash after *perelegans*, as well as the wrong position given by me to *Vancouverensis*, the locality has been misplaced, as I give no locality to species unknown to me in this last list. Mr. Edwards quite naturally was our authority as to the Californian species. Since Mr. Butler considers the various Asiatic forms of *Triptogon* as *local*, rather than *true* species, I thought it might be so with *occidentalis*; but it may well be a mere variety, as Mr. Holland considers it. If I remember, Mr. Edwards originally described it as a geographical variety of *modesta*, which may be true if no typical *modesta* occur in California, and although this var. *occidentalis* may also be found in the East. This species will have then received four names (two applied to varieties) since *Cablei* from Louisiana, the larva on water plants, seems nothing but *modesta*, which its author did not know.

Mr. Holland's note on *Hemaris uniformis* is exceedingly opportune; from the data it may well be that it is a more northern form. But, if so, what are we to make of Mr. Hulst's assertion (for he had no material) that *Floridensis* is a *large* variety of *Thysbe*?—naturally, of course, of *uniformis*, for the band is not dentate in the Florida species. And why do we not find dentate *Buffaloensis*? if this is only a "small" variety, naturally, also, of *uniformis*. That Prof. Lintner describes the larva of *Buffaloensis* and appears to regard it as distinct (in letters Prof. Lintner kindly informed me he considered the imagos distinguishable) does not seem to have had any weight with Mr. Hulst, whose discovery of the relationship between *uniformis* and *thysbe* seems to have affected his proper study of these forms. I believe we may find that these are distinct species.

In view of this paper of Mr. Holland's, my list in July No. must be amended by referring *occidentalis*, No. 54, as a var. to *modesta*, No. 53. Further, No. 79, *oreodaphne* Hy. Ed., may be referred as a var. *min.* to No. 78, *chersis*; while the position of No. 82 must be changed to follow No. 76, *drupiferarum*, the name followed by a dash, as I do not know the species of which *Vashti* may well be a synonym, as Strecker's figure of *Imperialis* does not also quite agree with specimens of *occidentalis*, yet

is that species, and the synonyms of this author are unusually numerous in this family.

This reduces the number of our Sphingidæ to 95, which is an ample allowance, since I have my doubts as to one or two other species not studied by me. I refer to my paper, *Papilio*, 2, 172, for notes on unidentified species of Clemens, Kirby and Boisduval. I may also refer here to my pamphlet on "The Sphingidæ of the Middle States," issued separately, which may, I hope, be of value in view of my continuous studies on this group of Lepidoptera.

NOTES ON FENESICA TARQUINIUS, FABR.

BY PROF. C. V. RILEY.

In his interesting article "On the History and the Preparatory Stages of *Fenesica tarquinius*" (CANADIAN ENTOMOLOGIST, xviii., pp. 141-153) Mr. Wm. H. Edwards makes some comments upon my article in *Science* of last April (30th), in which I announced the carnivorous habit of the larva of this species. He has been led to do so in part by the incorrect report in *Entomologica Americana* of the Proceedings of the Entomological Society of Washington for January 6th last. In that report "Mr. C. L. Johnson" is said to have observed "a lepidopterous larva feeding on a species of Aphid," but the report is incorrect both as to the fact and as to the name. Judge Lawrence C. Johnson, an old-time correspondent and for a while one of my assistants in Mississippi, was the correspondent intended, and his communication, which I was familiar with, particularly states that "he thought he saw the larva eating the plant-lice, but failed to convince himself of the fact." Mr. Lugger, in the very report quoted by Mr. Edwards (CAN. ENT., xviii., 142, lines 2 and 3) expressly states that "he had never actually seen them (*Fenesica* larvæ) feeding upon the Aphids," and as he previously remarked that he had "made the same observations" as Mr. Johnson, the report in *Entomologica Americana* is inaccurate and contradictory on its face. Mr. Lugger is one of my assistants here and I knew of his observations. Mr. Edwards' statement that "all the gentlemen named had seen the larva feeding upon Aphides" is, therefore, neither justified by the facts nor by his own quotations, and whatever

obscurity he may have labored under through the careless report in *Ent. Am.* will, I hope, be hereby dissipated.

Proof of the carnivorous habit is what I was aiming at, and it is one thing to presume a probable fact; it is another thing to establish it. The presumptive fact had been recorded here for four years, but the positive fact was only obtained by Mr. Pergande at the time stated by me.

Again, in another place (*loc. cit.* p. 152, paragraph 4) Mr. Edwards's language would indicate, to one not familiar with my article, that I had said something to the effect that no other butterfly had, or could have, a carnivorous larva. He makes me say in fact that "this is the only butterfly known whose larva is carnivorous"; whereas my language was, "so far as I can find, there is not another recorded carnivorous butterfly larva." No one could justly use his language who was not familiar with the larva of every butterfly known; whereas my remark simply emphasizes mine as the first record of such a carnivorous butterfly larva and leaves the implication that others may be found.

I was much interested in the experience of Mr. Edwards and Miss Morton, not only because it confirms the carnivorous habit of the species announced in my paper, but because it adds so many interesting observations which tend to prove the carnivorous habit normal and not exceptional.

Mr. Edwards has asked me to publish the facts we have recorded here in the C. E.

Mr. Pergande's notes were merely chronological and colorational, connected with the preserved egg-shells and about 30 larvæ of all sizes. I did not use them last spring because I had not time to go over the material and draw up full descriptions that should combine structure as well as coloration. Ill health has since prevented, and with Mr. Edwards's very full descriptions there is no longer the necessity. In brief I may state, however, that Mr. Pergande's notes show that:

July 8, 1880, the larvæ were found in the leaf curls of *Pemphigus (fraxinifolii)* on Ash, and that the larvæ died without feeding on the leaves that were placed with them.

In 1881 search was again made for the larvæ on the same tree without finding any.

Aug. 23rd, 1882, three larvæ were found on a twig of Witch Hazel;

they were not feeding when seen and attempts to feed them upon leaves, with which they were placed in a jar, failed. The larvæ died.

Oct. 2, 1882, several larvæ were noticed with *Schizoneura tessellata*. They were intermixed with the plant-lice and not readily observed, but seemed to hide among the mass of plant-lice. They were brought home with some of the Aphids for experiment, and while the butterfly larvæ were actively crawling about for some days, they all died without its being noticed that they fed upon the *Schizoneura*.

Sept. 18, 1884, again a few larvæ were found among the same *Schizoneura*. They were placed in a jar with the branch containing some of the plant-lice. Subsequently the larvæ were found crawling about and the lice had disappeared, some of them having apparently been eaten. This gave rise to a conviction that the butterfly larvæ feed upon the lice, but they all died without the fact being proven.

Aug. 8, 1885, the larvæ were again found of all sizes among *Pemphigus imbricator*. They were quite active, crawling over the plant-lice, and stopped as soon as the twig was touched.

The egg-shells were at the same time observed and the actual fact of feeding upon the lice was proven by direct observation.

August 12th several had changed to pupæ, and by Aug. 20th four imagos of *tarquinius* had issued.

I have already sent the substance of this communication to Mr. Edwards, but believe that it will have interest, in connection with his article, for the readers of THE CANADIAN ENTOMOLOGIST.

Washington, D. C., Nov. 10, 1886.

NOTE ON FENESICA TARQUINIUS FABR.

BY GEORGE HALEY, BROWNFIELD, MAINE.

I have seen this butterfly light on a species of Aphis, *Schizoneura tessellata*, found on *Alnus* in crowds on the bark, and from the position of its abdomen it seemed to be going to lay an egg among the plant-lice, but seeing me, she did not. Afterwards I scraped some of these larvæ off a twig of Alder and found a couple of larvæ; I sent them to Mr. W. H. Edwards, and he said that they were *F. tarquinius*, as I thought. The

larvæ were under the bodies of the plant-lice, covered with a thin network of silk to keep the woolly secretion of the Aphides away from them. They were only half grown. On another occasion I found two full-grown larvæ among the plant-lice in the same position as the first. One of these changed to a chrysalis and I have it now. It is hung up like other chrysalids of the family Lycænidæ, and has a peculiar humped back. This butterfly is always wandering round Alder bushes with a peculiar flopping motion, as though its wings were too large for its body. After I sent the larvæ to Mr. Edwards, saying that I thought they fed on the plant-lice, as there were many dead bodies, or skins, of the lice where I found the larvæ; I saw in the June (1886) number of the *American Naturalist* that the larvæ probably fed on this species of Aphis, also on *Pemphigus fraxinifolii*, found on the twigs of beech trees. Next summer I intend to observe the habits of this butterfly and its larvæ more closely.

THE OPERATIONS OF A PREHISTORIC BEETLE.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Some years ago, I received from Prof. G. J. Hinde, of Toronto, a twig of juniper about as thick as, and a little longer than, one's finger, which he had taken from interglacial deposits at Scarboro', near Toronto, and which showed the marks where beetles had bored the surface just beneath where the bark had been. From the same locality a number of remains of beetles have also been found, mostly Carabidæ, two of which I described at the time as new species of Loricera and Loxandrus. The others still remain unpublished, but there are none among them which could have made these borings, as these are evidently the peculiar work of some species of Scolytidæ, and apparently one of the Hylurgini, though in our very imperfect knowledge of the characteristics of the mines made by existing forms of this family, it is difficult to pronounce on its relations.

There are parts of at least six different sets of borings on this small twig, and all are evidently the work of one species. The mating-chamber is more or less triangular, generally equiangular or tridentate, one angle

upward. From two of these chambers no main galleries arise ; there may be some special reason for this, since they are much narrower and much more deeply excavated than the ordinary chambers ; they were perhaps unsatisfactory to the constructor and left unfinished.

From the other mating-chambers, which are about three millimetres in diameter, the main galleries generally run obliquely, but more nearly transversely than longitudinally to the stem ; they are subequal and take their rise one on each side of the mating-chamber at the lateral angles, and run in exactly or almost exactly opposite directions. In one case, however, there is but one main gallery, and in another they are at right angles to each other, one being perpendicular ; in this latter case, the mating-chamber is reversed, the apex being downward. These main galleries vary from one and a half to eight millimetres long, and are slightly more than a millimetre wide, with dentate edges, where the eggs were probably laid by the parent.

At least this is the general custom with the Scolytidæ ; but here, as in some other rare cases, the young larvæ do not commence to mine, each at right angles to the main gallery, but collect together and all start from one spot, the summit of the mating-chamber or the extremity of one of the galleries, and thence burrow in irregular and somewhat interlacing mines along the stem, and all apparently either upward or else downward, not, as is usually the case, in both directions ; apparently they may often turn upon their course again and again, or they may mine in an almost perfectly straight line, or in a tortuous line, for half a decimeter. In that whole distance the mine will scarcely have doubled in width with the growth of the larva, and in many cases it is difficult to tell in which direction the larva moved. The greatest width of these larval mines is scarcely more than half a millimetre, and they vary greatly in depth. The connection between the main gallery and the mines is often obscure, owing doubtless to the larvæ burrowing, while young, more in the bark than in the wood. In one case there is a mating-chamber and a pair of short galleries, but nothing more ; here, apparently, the mother fell a prey to some enemy before accomplishing her purpose.

This mode of origin of the larval mines seems to be different from anything described hitherto, and therefore it is difficult to decide to what group the insect making the mine belonged. In the Museum of Comparative Zoology at Cambridge is a mine of the European *Scolytus rugu-*

Iosus on cherry, which shows a somewhat similar distribution of the larval mines, which emerge and diverge from one point of the mating-chamber ; but the main galleries are reduced to almost nothing, and the normal mine of this species, as figured by Ratzeburg, shows nothing of the kind.

Of course it is entirely possible that the species which constructed these mines is still living and doing similar work. If so, it is probably a northern species, and my object in publishing this account is to ask if any one in Canada can produce similar borings on juniper or some allied conifer, made by existing beetles. I have for years searched for such in vain, on every occasion which offered. The nearest approach to it that I can find is in the mines of *Phlæosinus dentatus* (Say), figured by Packard.

NOTE ON DICERCA DIVARICATA, SAY.

BY F. B. CAULFIELD, MONTREAL, P. Q.

On the 12th of last June I observed a female of this species on a dead Maple. She was creeping down the tree, feeling the interstices of the bark with her ovipositor, but apparently without finding a suitable place, as no eggs were deposited so far as I could perceive. On the 19th, I observed another female, also on Maple. She was resting head downwards with the terminal segments of the abdomen slightly inclined, the ovipositor extended at a right angle with the body and placed in an old hole of some borer. She remained in this position for several minutes, the ovipositor being alternately dilated and contracted as if eggs were passing through. After she had gone away, I examined the place and found that, at a little distance from the surface, the hole was stopped with a smooth grayish substance. Not having a knife about me, I tried to remove it with a stalk of grass, but only succeeded in breaking it up into a yellowish fluid. I have no doubt that the creature deposited an egg, or eggs, and covered them with a kind of cement. Whether this is the usual manner in which the species oviposits I cannot say. The only reference that I have seen is in Packard's *Insects Injurious to Forest and Shade Trees*," where he says, speaking of insects attacking beech :—" Observed by Mr. George Hunt laying its eggs in the bark in July."

ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN LEPIDOPTERA.

BY AUG. R. GROTE, A. M.

(Continued.)

The study of the forms referable to the first or European element in the North American Moths, is complicated by the circumstance of the great range in the character and amount of the differences separating the related species now living so widely apart. These related species are found, in fact, to offer also difficulties as to their correct nomenclature. We have seen that the term "representative species," like that of "prophetic types," hides the real significance of the inter-resemblance which is that of a common descent. In naming these "representative" forms we must be guided by the rule that where the differences are such that the species would be considered distinct if members of a common fauna, a different specific title must be given them, but where these differences are slight, and what, under the same supposition, would be considered only varietal, the species must be considered as still identical, though separated so long in time and by so wide a space. The study of those forms which are practically identical is, as we have seen, further complicated by the difficulty of deciding as to whether they may have been introduced since the discovery of the New World by the Spaniards, or whether the species have continued unaltered since the Tertiary in both America and Europe. While certain species such as *Scoliopteryx* are undoubtedly in this latter case, it is less easy to feel so sure with regard to this in instances like *Dipterygia Pinastri* and the various identical forms of *Agrotis*, but on the whole I am inclined to believe that the number of species artificially exchanged is very small, and that these identical species have simply proved more constant and are of an older type than the rest. An agent which, however, must not be omitted in the interchange of species of insects is the voluntary importation by collectors for purposes of acclimatization, deception, or from a desire to destroy, through the introduction of injurious species, the crops of another country. It seems quite clear that the Natural History of most insects precludes the idea of their importation in an accidental way by commerce. It seems certain that the Colorado Potato Beetle never found its way to Europe in cargoes of vegetable provisions. Where it was found on the Continent it was evi-

dently sown by mischievous persons receiving live specimens through the mails. In the Moths, the wood-boring species may be introduced by accident, but, unless in such cases as the Currant Clear Wing (*Aegeria*), such an introduction would be usually futile for the establishment of the species. Specimens of the Wood Leopard, *Zeuzera Aesculi*, are said thus to have been found about New York, and even the Goat Moth, *Cossus Ligniperda*, is stated to have been so found. Again, in Wood's "Index Entomologicus," are figures of one or two of our Noctuidæ, the originals of which, if authentic, must have been accidentally introduced into England, and disappeared again without leaving progeny behind them. One or two cases have fallen under my notice where deception has evidently been intended, but the naturalist, from his knowledge of the habits of the insect, will quickly detect such frauds. One case of reported identity I regret not to have been able to verify. It is that of the European *Catocala Nupta*, said to have been found on Long Island. Now the genus *Catocala* is peculiar to the Northern Hemisphere, and our species and the European have undoubtedly a common ancestry. But the remarkable fact is that our forms have differentiated widely and multiplied exceedingly, so that we have fresh Groups and a much greater number of species compared with Europe. That, therefore, one form of *Catocala* should have remained constant is, to me, incredible, and I shall prefer to believe that the reported American specimens of *C. Nupta* are the result of recent importation or of deception. We have witnessed the acclimatization of the Chinese Silk Worm, *Philosamia Cynthia*, on the Ailanthus trees in the vicinity of New York and Philadelphia, and, in the case of the Spinners, cocoon-making species, it seems likely that the wholesale transference of such species in the pupal state would result in the permanence of the form in the wild state in the new locality. But the very difficulty which generally attends the introduction of new species into a fresh locality, suggests that most of the species common to America and Europe have simply remained unaltered since prehistoric ages. The pattern of ornamentation has remained constant, while Dr. Speyer has noticed a shading or quality in the colors which renders the specimens still distinguishable by the practised eye, and which is evidently due to the differences in light and humidity. But, as in the case of *Catocala Nupta*, the naturalist will have to take into consideration the whole range of special facts to decide any one case where historic evidence is totally wanting.

The Moths are unequally represented, both as to the number of species and that of individuals, over our territory. The barren and hot lands of the South-west nourish few species, while the lands along the Eastern coast, from Massachusetts to Virginia, seem to be among the most prolific in the variety of kinds. Certain species swarm in certain localities, as one or two kinds of *Cataclysta* on the islands in the Niagara River and elsewhere in the North. In Alabama, aside from the Cotton Moth, it was at certain times hardly possible for me to read at night by light for the swarms of *Acrolophus agrotipennella* and *mortipennella*, which fluttered over the table and the page. Colorado is a rich field for Moths, as also certain portions of Texas, judging from the collections of Belfrage (Bosque County) and Boll. The pine lands of the Southern States are on the whole poor in species, and, in parts of North and South Carolina, I found the collecting poor, without, however, preventing the occurrence of many interesting Moths. Practically we have one common fauna, broken by the Alleghanies and other mountain ranges, until we get as far South as the tropical colony in Florida, while in Texas we meet South Californian species, besides the first indications of the tropical Mexican fauna of the low lands, which extends its range along the coast so far north as Louisiana. The Moths go hand in hand with the vegetation and the flowers, so that rich botanical districts are also rich entomologically. Swampy or boggy spots yield many peculiar moths; the different species of *Sarracenia*, the Pitcher-plants, both at the North and in the South, yield several curious Moths, among which the species of *Exyra*, a genus of Owlet Moths, the larvæ of which feed on the folded leaves, are the most noteworthy and the prettiest in color.

In a final consideration of the second, or South American element, in our fauna of Moths, we must distinguish, as we have seen, between those forms which have effected a more or less precarious lodgment in our territory and those which, through distinct species, have become thoroughly amalgamated with the North American fauna. The occurrence of such species as *Syllectra mirandalis* or *erycata*, or *Thysamia Zenobia*, is undoubtedly accidental and may not occur again for years. On the other hand, there is a stream of certain species which yearly reach points in our territory, such as *Arges Labruscæ*, without leaving progeny; there are then other species which have attained a more or less extended foothold, such as the Owlet Moths belonging to the genera *Anomis*, *Aletia*,

etc. With these may be reckoned the members of the South Florida colony of Moths, species like *Cautethia Grotei*, also found in Cuba, and many others. Finally, the thoroughly domiciled Southern element is seen in such genera as *Hyperchiria*, of which we have four or five species, the most widely disseminated of which is *H. Io*, a form not reaching the tropics and becoming somewhat variable in the Southern States. This genus is numerous in South and Central American species. Our prettiest species of *Hyperchiria* is, perhaps, *H. Zephyria*, from New Mexico and Arizona, in which the dark primaries have a white stripe running from apex to middle of internal margin. The hind wings are yellow with a large central ocellus and pink hairs at base; the thorax is fuscous, marked with white on the sides, and the abdomen is fawn color shaded above with red.

(To be Continued.)

NOTICE OF DR. WILH. MULLER'S WORK ON THE SOUTH AMERICAN LARVÆ OF THE NYMPHALIDÆ.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Readers of THE CANADIAN ENTOMOLOGIST have, no doubt, through the papers of W. H. Edwards, followed with interest the discovery of so many facts bearing on the evolution of species in the Butterflies. We have now a work by a German writer of remarkable industry and ability, on the larval peculiarities of the Nymphalidæ, which deserves the study of all interested in Lepidopterology in America. The work is adorned by four plain lithographic plates of the caterpillars and their peculiar structure, of such fineness and softness of execution that, with all my experience, I hardly know where to find their equal. The work itself is a separate part of my friend Prof. Spengel's very useful "Jahrbücher," a zoological publication which deserves to be largely encouraged. The publication may be obtained at the office of Gustav Fischer, Jena, Germany, and this work on the Nymphalidæ costs about three dollars (11 marks). The book itself (252 pp.) is too lengthy to be adequately reviewed here. It is a minute study, throwing light on the genealogy of the family from the structure of the caterpillars, and it is conducted with an ability which is simply marvellous. Only in this way can we become acquainted with the ancestry of our present Lepidoptera, a study which is perhaps the most fascinating suggested by these insects, and which has only become possible since Mr. Wallace and Mr. Darwin opened the doors to this field of speculative inquiry.

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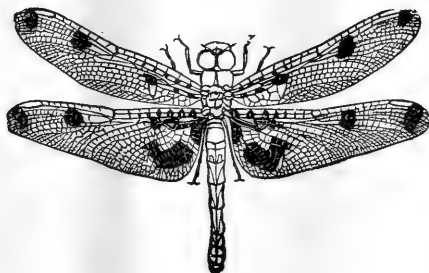
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No. 11

DESCRIPTION OF THE PREPARATORY STAGES OF COENONYMPHA GALACTINUS, BOISDUVAL.

BY W. H. EDWARDS, COALBURGH, WEST VA.

EGG.—Conical, broadly truncated, the flat top covered with a low network of irregular meshes, very fine about the micropyle; the lower part rounded, almost hemispherical; the upper part of side and to about two thirds the distance to base ribbed vertically,—about forty low ribs, with fine transverse lines between them; below the ribs there is an irregular network; color yellow-green. Duration of this stage about 13 days.

YOUNG LARVA.—At 24 hours from egg, length .1 inch; thickest at 2 and 3. Dorsum and sides sloping regularly to 13, ending in two short conical tails, which meet at base; color pale yellow-green, under side more yellow; a mid-dorsal brown line, and three such lines on the side, the lowest running with spiracles, the next near it, the third at a little greater distance from second and in fact, sub-dorsal; on each segment are white clubbed processes, each of which rises from a rounded brown tubercle; these form three rows on either side, one sub-dorsal, one mid-lateral, with a demi row between the two on three anterior segments; in these rows there is one process to the segment; the third row is at base, over feet and legs, two processes to each from 5 to 11, one each on 3, 4; on 2 and 12, 13, two hairs to each, in place of processes; these lower processes are smaller than elsewhere, and less bent, but are turned down; the upper rows are bent back, except on 2, there forward; feet and legs color of under side; head one half broader than 2, rounded, narrowing towards top, depressed at top; color pale pink; over the face are a few white tubercles with processes like those upon body, bent down. Duration of this stage 12 days.

After First Moulting.—At 24 hours, length .19 inch; nearly same shape; color yellow-green; covered with fine, irregular white tubercles, each of which gives a very short hair, all except on 2 turned down and back; the

mid-dorsal line green ; three green lines on side ; the basal ridge yellow ; head sub-globose, a little broader than 2, depressed at top ; the surface much covered with fine white tubercles and short hairs ; color green, darker than body. To next moult 7 days.

After Second Moult.—At 18 hours, length .32 inch ; generally as at second stage ; color more yellow, greenish-yellow, the tails reddish. To next moult 10 days.

After Third Moult.—At 24 hours, .56 inch ; shape as at previous stage. Soon after this moult some of the larvæ gradually changed to buff and red, the others remaining green.

MATURE LARVA.—Length .84 to 1.06 inch ; slender, scarcely arched dorsally, of even height and width from 3 to 7 or 8, then tapering gradually ; ending in two short conical tails which meet at base, and are rough with tuberculations ; whole upper surface of body covered thickly with fine sub-conical white tubercles, each of which gives out a fine short hair, so that the surface is downy ; these hairs are either tapering, or clubbed, or cylindrical with round tips ; color yellow-green striped longitudinally with yellow, there being two narrow, pale stripes near together on mid-side, and a heavier and deeper basal stripe ; on mid-dorsum a dark green line edged by paler green than elsewhere ; the tails tipped with red ; under side, feet and legs bluish-green ; head broader than 2, sub-globose, narrowing towards top, a little depressed at suture, finely granulated, and with a very short down ; color greenish-yellow, the mandibles brown, the principal ocellus emerald in brown ring.

Or the body was reddish-buff, the stripes yellow ; the tails red ; under side red-brown ; feet green, legs red-brown ; head greenish-yellow, with a tint of brown. In one larva the sides stripes were nearly obliterated, leaving the side almost solid buff. From third moult to pupation about 12 days.

CHRYsalis.—From green larva : length .36 inch ; breadth at mesonotum .14, at abdomen .16 inch ; shape of *Satyrus Alope*, the outline of ventral side more straight, the abdomen more swollen and less tapering ; cylindrical, stout, the upper end truncated, the abdomen swollen, conical at extremity ; head case narrow, ending in a sharp cross ridge which is a little arched at top, its sides excavated roundly ; mesonotum prominent, arched, the carina rounded transversely, the sides slightly convex, followed by a shallow depression ; color yellow-green, over dorsum and abdomen

finely specked with white ; marked by nine black stripes of irregular length ; of these there is one on dorsal edge of each wing case from base to inner angle of wing ; a curved stripe on middle of each wing reaching the hind margin ; a short stripe on the hind margin on ventral side of the curved stripe ; two short parallel ventral stripes on antennæ cases, a longer one on ventral side between the wings ; besides these there is an imperfectly colored narrow stripe on either side at posterior end ; top of head case whitish with a dash of black below this on dorsal side.

From buff larva : color pinkish-brown, no black stripes, but the curved wing stripes appear in deeper brown, and along dorsal side of wing cases the same.

Another chrysalis from a buff larva was green, fully striped, but the wing cases were buff.

Another from buff larva was pinkish at first, with three darker stripes on dorsum, one on middle below the excavation, one short one on either side this, and all the stripes first described were also present, but were faint brown ; this chrysalis in a day or two had changed to full green, with the nine black stripes, but lost the three additional ones.

Another was wholly green, no stripes at all. So that there is much variation in the number of these stripes, as well as in color of the chrysalis. Duration of this stage 11 and 12 days. Result wholly form CALIFORNICUS Bd.

GALACTINUS was described by Dr. Boisduval in 1852, together with *Californicus*. Of the latter he merely says : " It is found here and there in shaded places." Of the other : " Inhabits the mountains in the north, and appears to be rare." The two forms, as is seen from what I have stated above, are of one species, *Galactinus* being the winter, *Californicus* the summer form. It appears to be a common species near San Francisco. On 1st May, 1885, I received 13 eggs laid by *Galactinus* from Prof. J. J. Rivers, at Berkeley, and which were mailed 23rd April. Hatching began 5th May. On 7th, I received another lot, which began to hatch on 8th. By 11th, all had hatched. On 17th May, the first moult was passed by some of the larvæ ; on 24th May, the second moult ; on 3rd June, the third. The first pupation took place 15th June, and first butterfly came out 26th June. From laying of eggs to imago 65 days, the egg stage being 13, larval 41, chrysalis 11. The growth was rapid for a Satyrid, and in contrast with the tedious growth of Coen. *Ochracea*. The

larvæ feed on any species of lawn grass in confinement. I had grass in flower pot, covered by a muslin bag, and changed as it was eaten or lost its freshness. In all I brought seven larvæ to pupation, but at every stage had put one or two in alcohol. The number of moults was three, but probably the winter larvæ pass a fourth in spring, as does the larva of Coen. *Ampelos*. In general appearance the larvæ and chrysalids much resemble the genus *Satyrus*, but the processes on the young larvæ have nothing of the fish-bone character of *Alope*. The peculiar stripes on the chrysalis seem to be a generic character, as *Ampelos* and the European *C. Davus* (according to Mr. Wm. Buckler, *Larvæ of British Butterflies*, vol. 1, page 36, plate 6). But in *Davus* it is said that the pupa was light green at first, and "in a few days showed brown streaks on the edges and centre of the wing covers and at the tip of the tail." The figure on plate shows pale stripes to same extent and number as on *Galactinus*. The eggs are quite different from eggs of *Satyrus*, and still more unlike *Neonympha*, having a great number of ribs, which cover only the upper two thirds of sides.

NOTES ON THREE SMALL COLLECTIONS OF DIURNAL LEPIDOPTERA MADE DURING THE SUMMER OF 1886.

BY GAMBLE GEDDES, TORONTO.

The following species were taken by Capt. Gilpin Brown (late H. M. 92nd Regiment) in the Island of Newfoundland, during the months of July and August last :

1. *Grapta Faunus*, *Edw.*
2. *Chrysophanus Florus*, *Edw.* (or *C. Helloides*, *Boisd.*—uncertain.)
3. *C. Epixanthe*, *Bd.-Lec.*
4. *Argynnis Atlantis*, *Edw.*
5. *Melitæa Harrisii*, *Scud.*
6. *Phyciodes Tharos*, *Drury.*
7. *Colias Interior*, *Scud.*
8. *ib. var. Laurentina*, *Scud.*
9. *Cœonympha Inornata*, *Edw.*

Strange to say, no specimens of *Lycaena Couperii* or *Papilio Breviceps* were seen, though possibly it was too late in the season for both species.

The variety *Laurentina* of *Colias*, found by Captain Brown, is interesting from the fact that it is the identical species from which Mr. Scudder made his descriptions and observations in 1876. It has a very distinct appearance, being much rounder in the outline of its wings—whether open or closed—than any of the species of *Colias* with which I am familiar.

It is interesting also to find *Cænonympha Inornata* in Newfoundland; this species is quite different from the *C. inornata*, so named by Mr. W. H. Edwards, from the prairies of our North-west. The difference is so marked that I am inclined to think that the butterfly that is so common in the North-west is *C. Ochracea*, Edw., and that *Inornata* proper does not occur there. This conclusion is arrived at after consulting abundant material, over one hundred specimens having been examined.

II. At Lake Superior, in the neighborhood of the Kaministiquia River, I took the following species:

1. Grapta Progne, *Cram.*
2. *Colias Edwardsii*, *Behr.* ♂.
3. " Interior, *Scud.*
4. " Philodice, *Godt.*
5. " Hagenii, *Edw.*
6. " Eurytheme, *Boisd.* (seen in numbers, but not taken).
7. *Pieris Virginiensis*, *Edw.*
8. *Argynnis Bellona*, *Fab.*
9. " Chariclea, *Schneid.*—quite common.
10. " Atlantis, *Edw.*
11. " Myrina, *Cram.*

These lists are published for the sake of the localities, as I believe there is no authenticated report of the appearance of *Colias Edwardsii* so far east, or of *C. Hagenii*; also *Argynnis Chariclea*, or *A. Boisduvalii*, which I have found at a high altitude in the Rocky Mountains, but not so far south and east as Port Arthur, on Lake Superior.

III. A small collection of butterflies was made last summer in the Hudson Bay Straits by Mr. Frank Fitz Payne, of the Toronto Observatory, who accompanied Lieut. Gordon's expedition on the "Alert" to the Arctic Regions. The specimens were kindly identified by Mr. W. H. Edwards,

of Coalburgh, West Va. They can be easily referred to at any time in my collection.

Although Mr. Payne devoted much of his time to the collection of insects, I regret to say that nothing absolutely new to our present list of diurnals of N. America has come to hand. With the exception of one curious green ♀ of *Colias Hecla*, Lef., Mr. Edwards had seen all the species before. As this ♀ was the only one out of many that had this peculiar appearance, it may perhaps turn out to be something new—there being a great similarity between all the others.

The *Chionobas* vary greatly in size and appearance of apparently the same species—*Chionobas Taygeta* and *Chionobas Crambis* particularly. In *Chionobas Semidea* the shades of gray in some are quite light in color, and in others run almost into black.

The following is a complete list of the butterflies taken :

1. *Colias Hecla*, Lef.
2. " *Nastes*, Bd.
3. *Argynnis Polaris*, Bd.
4. " *Freya*, Thunb.
5. *Chionobas Semidea*, Say.
6. " *Crambis*, Frey
7. " *Taygeta*, Hüb.
8. *Lycæna Aquilo*, Bd.

I hope at no distant date to be able to give a list of the moths, and as far as possible of the Hymenoptera and Diptera. Strange to say, no Coleoptera were seen at all.

CORRECTIONS TO MY PAPER IN JULY NO. OF CANADIAN ENTOMOLOGIST.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

On pages 121-122 the generic term *Lepisesia* is twice written wrongly, "*Lipisesia*." To my statement with regard to the food plants of the *Smerinthinæ*, must be added that several unocellated genera feed on forest trees, such as poplar, linden, oak, etc. I have taken our *geminatus* on willow; my statement as to fruit trees (*Rosacæ*, *Caryæ*) gives the

general food of *Cressonia*, *Calasymbolus*, *Smerinthus* and *Paonias*. I would likewise add to my remarks as to the sequence of the groups that they seem to me to form two series; the first embracing the *Macroglossinæ*, *Charocampinæ* and *Smerinthinæ*; the second the *Acherontinæ* and *Sphinginæ*; the members of each series resembling each other more than the members of the opposed series. With regard to my List, p. 126 et seq., I would say that the manuscript was in the main long completed, perhaps nearly a year before I received Prof. Fernald's excellent paper. After receiving it I merely so far corrected and added to my MSS. This accounts for the resemblances between my paper on page 121 and my preface to the List, in both of which I bring out the same points with regard to the groups. In the List itself "*Noctuiiformis* ‡ H.-Sch.," should be cited in the synonymy of *Cautethia Grotei* Hy. Ed. It has been shown that the Cuban and Floridian species are the same, but Walker's *Noctuiiformis* from St. Domingo is a different species. I only accidentally saw the description of *S. Separatus*; and possibly some species described within the last three years has escaped me during my absence from home.

Oct. 23, 1886.

NOTES ON ABNORMAL TYPES OF THE LARVA OF SMERINTHUS MYOPS.

BY ROBERT BUNKER, ROCHESTER, N. Y.

For three years past I have reared this species from eggs and young worms, and in no instance have they agreed with descriptions I have met with. Two years ago I had a brood of eight. Three of them had six spots—three on each side—two four spots, one two spots, and two without spots.

Last year I had nine, not one of which had the least semblance of a spot, and were lighter green than those of the year before. This year the brood consisted of seven, two of which were unspotted, one with four, three with two, and one with a single spot.

Where there were but two spots they were invariably on the third segment. In case of four spots on the third and seventh. When six occurred the intermediate ones occupied the fifth segment. The unique

that claimed but one spot was polite enough to carry the *insignia of rank* on the right side of the third segment.

The immaculate specimens were destitute of oblique lines on the sides, or at least the lines were so faint they could scarcely be seen.

The two broods produced fine specimens. The third has entered the ground, and no doubt will appear in their rich dark brown dress next spring. Smith and Abbott describe the spots as reddish brown; other writers as rust red. My specimens were bright crimson or cardinal red. Stigmatal spots olive green.

It will be seen from the foregoing that the larva of *Myops* is exceedingly variable; but that out of twenty-four specimens not an individual answered to the description given by authors is remarkable.

A NEW NOXIOUS CAPSID.

BY P. R. UHLER, BALTIMORE, MD.

Lygus monachus, n. sp.

Long oval, pale green or testaceous, coarsely punctate above, sericeous pubescent. Face convex, highly polished, bald; base of vertex with a longitudinal impressed line, towards which a similar line runs obliquely forward each side from the inner corner of the eye; antennæ sparsely and minutely pubescent; basal joint thickest, a little longer than the head, tapering at base; second joint thrice as long as the basal, infuscated, and a little enlarged towards the tip; third and fourth setaceous, both together not as long as the second. Pronotum highly polished, convex, coarsely punctate in transverse wavy lines, each side with a dark brown vitta, or long spot; lateral margins smooth, callous at base, the humeral angles subacute; callosities prominent, convex, almost confluent on the middle; lateral flap of pronotum irregularly punctate. Pectoral pieces pale, impunctate. Legs pale green, feebly pubescent; apex of posterior femur usually with one or two fuscous bands, tip of tarsi and the nails black. Scutellum moderately convex, excavated at base, transversely obsolete, punctate, more or less infuscated. Corium coarsely transversely vastrate-punctate, the clavus more or less infuscated, sometimes with all but the margins covered with dark brown; corium usually with a trans-

verse dark brown arc next the posterior border ; cuneus long and wide, the incised base fuscous and the inner margin brown ; membrane pale testaceous, with two or more dark clouded spots, the inner submargin of the principal areole, a spot at its tip and the base next the cuneus all more or less fuscous. Venter pale greenish.

Length of body, ♀ 5 millims. ; to tip of wing covers 7 millims. ; width of pronotum, 2 millims. ♂. Length of body, 4 millims. ; to tip of wing covers $5\frac{1}{2}$ millims. ; width of pronotum, $1\frac{3}{4}$ millims.

This has proved to be a very common insect in various localities.

Mr. Cassino collected numerous specimens around Peabody, Mass. Mr. Bolter sent to me a pair from Illinois and Missouri, and I have taken it from Alders, Maples and many other kinds of small trees and shrubs on Cape Ann, Mass., also near the base of the White Mountains in New Hampshire, and near Quebec, Canada.

Mr. Forbes has also forwarded to me specimens from near Normal, Ill. It resembles *Lygus invitus*, Say., and presents several of the color varieties common to that species, but it is a much larger insect, of a longer figure, and has a more flattened upper surface.

OCCURRENCE OF THE CHINCH-BUG (*BLISSUS LEUCOPTERUS*, SAY) AT BUFFALO, N. Y.

BY E. P. VAN DUZEE.

This pernicious insect has been very abundant here for many years. As early as 1874 I found it in considerable numbers among moss on dry, grassy hill-sides at Lancaster, N. Y. This season (1886) it was remarkably abundant in a dry upland hay field near the same locality. I have also taken it at Ridgeway, Ont. Ordinarily the short winged form predominates, but in hot, dry summers, such as those of 1881 and 1886, they mostly acquire fully developed membranes. I find on comparison with a lot of perhaps one hundred fully developed examples from Kansas, that ours are quite uniformly larger and more robust, with longer hairs on the pronotum.

Prof. J. A. Lintner says (*2nd Annual Report N. Y. State Ent.*, page 150) that, previous to its appearance in St. Lawrence county in 1882, the only recorded occurrence of this insect in New York State is that mentioned by Dr. Fitch (*2nd Report*, 1856, p. 287). From this it appears that it has not been recorded, if indeed it occurs generally in this State. Its early introduction at this locality is only natural, considering the immense grain traffic which yearly passes through this city direct from the infected States of the West, on its way to the seaboard; yet it does seem strange that its first appearance in sufficient numbers to attract general attention should have been in Northern New York, quite aside from any of the main lines of transportation, unless, as Prof. Riley suggests (*Science*, vol. II., p. 621), it be a native species, which, through an unusual series of favoring circumstances, has increased enormously in certain localities. That it has not been reported as an injurious insect in this locality seems to me no proof that it has not been injurious. To be sure, it has not appeared in such overwhelming numbers as to force itself upon public notice as in other places, but from my own observations I think that no inconsiderable part of the injury to hay fields charged to the dry weather is in reality the work of this insect, or rather the combined effect of the two. For example, the hay field at Lancaster mentioned above, which last year yielded an abundant crop, is literally ruined and will have to be plowed under in the spring, while other fields less protected, where the bug was not found in numbers, escaped injury; and I know of several other fields near this city apparently affected in the same manner.

I have always found this insect in hay fields, generally in timothy or clover, occasionally among wild grasses. I do not recollect ever having taken a specimen in a grain field of any kind. If it has so thoroughly acquired the habit of subsisting upon the cultivated cereals in the West, why should it not affect the same plants here, especially if it has been introduced from that section of the country through commercial transportation? It would be highly interesting to learn of its occurrence in this State at localities distant from main railroad lines.

LIST OF ORTHOPTERA TAKEN IN THE VICINITY OF
MONTREAL, P. Q.

BY F. B. CAULFIELD.

BLATTIDÆ.

- **Stylopyga orientalis*, *Linn.* Common in houses ; have also taken it under stones in a lane behind a bakery in summer.
- Ischnoptera pennsylvanica*, *De Geer.* Not common. I took a specimen under bark of a stump on Montreal Mountain some years since, and on June 4th, 1885, I took three specimens under bark of a stump at Abbotsford, P. Q.
- Temnopteryx marginata*. Rare. Two specimens taken under bark of a fallen tree on Montreal Mountain.
- **Ectobia Germanica*, *Stephens.* Common in houses in the city of Montreal. Has been so to my knowledge for the last fifteen years ; how much longer I cannot say.

PHASMIDÆ.

- **Diapheromera femorata*, *Say.* Common at Montreal.

GRYLLIDÆ.

- Gryllus neglectus*? *Scudd.* Abundant. Specimens in the larval stage may be found under stones as soon as the snow has melted. Have passed through their moults by the end of May, when they may be heard "shrilling." Have not heard them during July. Again heard beginning of August and from that to end of the season. Several heard shrilling October 30th, 1886.
- Gryllus luctuosus*, *Serv.* Very rare ; only two specimens taken.
- Gryllus domesticus*, *Linn.* Common in bake-houses.
- Nemobius vittatus*? *Harr.* Abundant. Its song commences about the first of August and lasts until the end of season ; heard shrilling October 30th, 1886.
- Nemobius fasciatus* *De Geer.* Not so common as last species.
- Cæcanthus niveus*, *Serv.* Very common ; season from about the first of August to about the middle of October.

LOCUSTIDÆ.

Ceuthophilus maculosus, *Harr.* Common under stones and bark of dead trees in damp situations.

Amblyconypha oblongifolia, *Harr.* Not common.

Phaneroptera curvicauda, *Serv.* Not uncommon.

**Xiphidium fasciatum*, *Serv.* Common in damp fields.

Xiphidium brevipennis, *Scudd.* Common in same localities as last species.

Orchelimum agile, *De Geer.* Common in tufts of herbage in damp places.

ACRIDIDÆ.

Stenobothrus curtipennis, *Harr.* Very common in fields during latter part of summer and fall.

**Tragocephala infuscata*, *Harr.* Common during spring and early summer; *var. viridifasciata*, not so common.

Melanoplus femur-rubrum, *Burm.* Very common during the end of summer and fall.

Melanoplus femoratus, *Burm.* Common during latter part of summer.

Dissostria carolina, *Burm.* Abundant during latter part of summer.

Ædipoda verruculata, *Scud.* Not uncommon.

**Ædipoda phœnicoptera*, *Germ.* Very rare, one specimen taken on Montreal Mountain, some years since.

Eucrotophophus sordidus, *Burm.* Not uncommon in dry fields during the latter part of summer; flies with a rustling sound like *Tragocephala*.

Camnula pellucida, *Scudder.* Abundant; appears about the middle of June and lasts until September.

Tettix granulata, *Kirby.* Common.

Tettix triangularis, *Scudder.* Not uncommon.

Tettigidea polymorpha, *Burm.* Very common.

Tettigidea lateralis, *Say.* Very common.

I have taken the four latter species in early spring as soon as the snow was off the ground. With the exception of those marked with an *, the species in the above list were kindly named for me by Mr. Scudder. The Gryllides were also submitted to him, with the exception of *luctuosus* and *domesticus*, but he wrote me that he was unwilling to say what they were until he could take time to study them.

ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN LEPIDOPTERA.

BY AUG. R. GROTE, A. M.

(Continued.)

Again, the genera *Citheronia* and *Eacles* are a South American element in our fauna, while the typical Attacinæ, such as *Actias*, probably belong to the Old World element in our fauna, together with all our *Platypteryginæ*. Among the Hawk Moths the genera *Philampelus* and *Phlegethontius* are of probable South American extraction, though represented now by certain strictly North American species. Mr. Robert Bunker, writing from Rochester, N. Y., records the fact that *Philampelus Pandorus*, going into chrysalis August 1, came out Sept. 10 as a moth, showing that in a warmer climate the species would become double-brooded. And this is undoubtedly the case with many species the farther we go South, where insect activities are not interrupted so long and so strictly by the cold of winter. Since the continuance of the pupal condition is influenced by cold, a diminishing seasonal temperature for ages may have originally affected, if not induced, the transformations of insects as a whole. Butterflies and Moths which are single brooded in the North become double brooded in the South. The winter is the season during which the activities of insects cease and the existence of Lepidoptera becomes artificially lengthened by the intervening of the cold. Premature hibernation is a relic of the time when the winters were longer than at present; this habit is seen in the case of the larvæ of several species of Butterflies, and is otherwise inexplicable. Again, the Notodontid genus *Apatelodes* is of a Southern type of this Sub-family of the Spinners, while *Datana* is descended ultimately from Tertiary Arctic forms. In these two cases the genera have probably gradually become distinct from their allies; nevertheless the relationship to existing genera in South America and Europe may be plainly traced. The foreign elements in our Moth-fauna overlap those which may be considered North American *per se*.

From studies of this nature, here briefly summarized and but partially displayed, the Science of Entomology derives an importance not discernable when it is limited to a mere sorting of species classified after their variety and their value according to the collection. It is part of the task

which the intellect perceives to await accomplishment after a mass of work has been performed in recognising the different kinds. It is hardly advanced by the use of difficult language and the employment of abstruse terms ; for my own part I have always tried to use plain English in the proportion as I seemed really to understand the subject I had in hand, and, without in any way undervaluing the use of proper scientific terms, I think that writings on our Butterflies and Moths are occasionally overloaded with them, to the detriment of the clear understanding of the subject. We are here facing the one simple problem of the ancestry of our present species and in explaining the existence of the different elements in our fauna, and in trying to sort a few of our leading genera, I have aimed at making the subject clear and attractive, if I could, rather than at expressing myself in a simply technical manner. After the first passion for possessing rare or fine specimens has become blunted, the deeper problems connected with these beautiful and interesting insects obtain a hold on the mind, exercising a more controlling fascination as they lead to wider results. I have been especially struck with the fact that so many leading genera, e.g., *Catocala*, do not cross the Equator, being confined to the Northern Hemisphere, as also that there is perhaps, on the whole, between the different faunæ, from East to West, a greater general resemblance than from North to South. The hot central Equatorial Region evidently precludes the passage of certain genera, notwithstanding its fecundity in peculiar forms. And notwithstanding physical barriers, such as oceans and mountains, there seems to have been a transference through changes in climate on isothermal lines around the globe. All these matters are very interesting to speculate upon, and the common mistake of setting up an hypothesis and then treating it five minutes afterwards as a fact as old and well established as the hills, I have myself often, no doubt, fallen into. But I have always relied on my friends to correct my mistakes in print, a matter they have ever promptly attended to, so that, in some sense, I feel quite secure in my statements, which, if they are likely to be true, will be "absorbed," and, if they are not, will be "corrected," myself abused and the public disabused by the operation.

The subject of geographical distribution is, as I have said, best studied in connection with the topography of the country. In this connection the two principal drainages of the country, the Mississippi and its tributaries, and the chain of the Great Lakes and the St. Lawrence, must be taken into consideration. Valleys and water courses have attracted and furthered

the propagation of animals, and assisted the development of the civilization of man. In America we have evidence of the former existence of human societies along the Ohio River, and to whatever branch of historical studies we may betake ourselves, the topography of the country must supply the foundations and become fixed in our minds. It is the scaffolding upon which is displayed the picture of animated Nature. After the physical features, the prevailing winds, the amount of rainfall, the *average* warmth must be observed. Early in my studies I became interested in the migrations of the Lepidoptera in North America. A yearly zoological wave sets in from the tropics and carries upon its crest numbers of light-winged Moths, which eventually range up our entire coast, and are found in Maine in the autumn. The summer, that pulse of the year, the length of whose recurring beat is at once the measure of the time elapsed since the culmination of the last ice period, gives us a prevailing northward direction for the winds that sweep the North American continent. They offer aerial paths along which numbers of feathery winged moths are hurried. They distinctly aid the dispersal of the Cotton Moth, for instance, and on the coast of Georgia it comes earlier or later as the south wind has blown fitfully or steadily. We have wind visitors on our shores during the whole season, some of which become citizens for a time by breeding intermittently within our territory.

All natural barriers succeed to some extent in producing more or less local variation in flora and fauna, and local variation ends, in connection with the climate, in producing distinct species. The species of moths inhabiting islands, or confined between mountain chains, often show distinctive features in color, size and markings. From what I have seen I think that *Thyatira Pudens*,* found on Anticosti, has become grayer, the pink spots less vivid than on the main land; the darkening by mixing of color, noticeable in Polar species, has here taken place. Many other instances occur to me in writing, but it is sufficient here to refer to local variation as affording an interesting part of the study of *Lepidoptera*. After a certain phase of variation has been attained it seems probable that interbreeding stops, and that, were the original form introduced, it would continue breeding side by side and without intermingling with the

* This variety is worthy of a distinct name, and in my second Check List of N. Am. Noct. (MSS.) I have called it *Anticostiensis*. The moth is grayer, more hoary, the pink color has faded. Mr. Wm. Couper has taken this form on the island.

local form, until finally succumbing to the same influences. A good deal of what we are now warranted in assuming, is merely reasonable conjecture in default of experiment, but more and more facts are becoming known, all tending to throw light on the origin of species, and in this progress the study of Butterflies and Moths has proved of the greatest assistance to naturalists and philosophers.

As a special illustration of the study of the probable origin of our North American fauna I may attempt a brief discussion of the genera of our Hawk Moths, and present some tables of the different categories. We have seen that there are three proximate sources for our fauna. 1, Descendants of an Arctic Tertiary fauna. This fauna was forced southward and apart by the last Glacial Epoch, the species descending into Central Asia, Southern Europe, and the American tropical and sub-tropical region. This category includes species now identical in Europe and America, and which have not been introduced by commerce in historical times, while these latter form a distinct sub-category. 2, Descendants of the North American Tertiary fauna, the members of which latter occupied about the same limits that their descendants do to-day, probably they ranged further to the North. 3, Descendants of an immigration from the South. This stream is still of yearly occurrence. A colony, as we have seen, has been planted in South Florida from the West Indies and South America. Probably also, on the decline of the Ice Period, certain species of South American origin settled permanently and became modified by their residence in the regained territory. This category includes forms permanently domiciled and also such as visit us merely during the summer and do not survive the winter. As belonging to the first category in the Sphingidæ we have the genus *Hemaris*, which in Europe has only two species, but with us from 12 to 15. (The series *Tenuis*, *Diffinis*, *Marginalis* and *Axillaris*, ranging from Canada to Texas, have probably the same origin as the European *Fuciformis*. And we have a distinct sub-genus, *Haemorrhagia*, which contains at least two distinct species, *Thysbe* and *Fuscicaudis*. If we are to believe Mr. Hulst, *Uniformis* is a dimorphic form of *Thysbe*, differing, as I pointed out, by the evenness of the inner edge of the terminal band of primaries. Now the typical series of four species of *Hemaris*, above mentioned, differ from each other in much the same way. In *Tenuis* the band is narrowest, tapering to anal angle, being *even* inwardly and the usual red apical spot wanting, or at

best only the faintest indication. In *Diffinis* the spot is distinct and the inner edge is very slightly *uneven*. In *Marginalis* the inner edge is regularly dentate on the interspaces. In *Axillaris* the dentations are irregular, some very deep and long, while the red spot has become almost a band, extending over the inferior interspaces. In *Haemorrhagia* the body proportions are slightly modified and the band is all claret red. In *Thysbe* the inner edge of the band is dentate. In *Uniformis* it is even. I have described and figured both sexes of *Buffaloensis*, a smaller form agreeing with *Uniformis* by the evenness of the band, while the cell is so filled in as to obscure the bar inferiorly. Now if *Buffaloensis* is only a starved or small *Uniformis*, why do we not find starved or small *Thysbe* with the band dentate? Similarly if *Floridensis* is a stuffed or large *Uniformis*, why is the shape of the band itself modified? Clearly we do not as yet know everything about these insects. We must experiment and breed them, without prejudice or desire to make more or less species than there really are. Mr. Lintner has, I believe, described the larva of *Buffaloensis*. We must not expect very great differences in the larvæ of these forms, but if they differ from each other and breed true, then they are good species. Mr. Hulst says *Thysbe* does not breed true, but occasionally produces *Uniformis*, and this we must accordingly accept. But it is not shown that *Buffaloensis* or *Floridensis* are so produced, or that Mr. Hulst knows these forms. I would recommend him to read and study our original papers and figures, which, of *Buffaloensis*, are very excellent, but, if I recollect right, the artist made a mistake in color in the abdomen of *Floridensis*.) Our next genus to *Hemaris* falls into our third category. The species of *Aellopos* are of South American origin. Our next Eastern genus, *Lepisesia*, is probably of North American origin and falls into the second category, but as to this I need further studies of the allied European *Pterogon Cnothæ*. But the following genera are decidedly North American in their origin, *Amphion*, *Thyreus* and *Deidamia*, while *Enyo* is again South American. The two Californian genera, *Euproserpinus* and *Arctonotus*, are, the first allied to the European *Macroglossum Stella-tarum*, while the second is *sui generis* and decidedly American. There remains, in this sub-family, the genus *Cautethia* to examine. This is undoubtedly South or Central American in its origin. The moth *Cautethia Grotei* is found in Florida and also in Cuba; thus it is a member of the Florida colony of which I have spoken, while the two other species, *Noc-*

tuiformis and *Spuria*, are found in Saint Domingo and Mexico respectively. Dr. Herrich-Schaeffer mistakenly identifies the Cuban species *Grotei* of Mr. Edwards, with Walker's *Noctuiiformis*, and in my papers on the Cuban Hawk Moths I followed him. In the second sub-family, the *Chaerocampini*, we have the genus *Deilephila* decidedly belonging to our first category. Here the position of *Hemaris* is reversed. We have but two species of *Deilephila* in America, representing the *Galii* and *Livornica* of Europe; while, in Europe, a number of species have descended from the common Tertiary progenitor of both the American and European forms. The remaining genera, except *Everyx*, are decidedly South American in character. Our two more Northern common forms of *Philampelus* have long been settled in our territory. *Pachylia* and *Argens* are South American, even as to species, the latter being a summer bird of passage. In the *Smerinthini* we have, as a whole, descendants from an Arctic Tertiary fauna, but certain of the forms probably are strictly belonging to our second category, such as *Cressonia* and *Paonias*. *Smerinthus* proper is only Californian, and *Calasymbolus* has probably an Asiatic species, *Kindermanii*, which I have never seen. *Triptogon* is decidedly a descendant of an Arctic Tertiary genus, which in Asia is represented by many species. The fourth group of the *Sphingidae* is not represented in North America. *Acherontia* is probably descended from Tertiary Old World ancestors which equally probably never occurred in North America. The fifth group, the *Sphingini*, is interesting from the mixture of genera of different origin. While the *Smerinthini* do not seem to cross the Equator, in the New World at least, the *Sphinginae* are widely spread, so that their origin is an interesting study. The forms of purely North American descent and belonging to our second category, are *Ceratomia*, *Dolba*, *Ellema* and *Exedrium*, genera with single peculiar species, if we except *Ellema*, which, with its unspotted abdomen, contains three doubtfully distinct species and is not unlikely derived from *Hyloicus*. I cannot believe we have to do with an aberrant *Smerinthoid* form, notwithstanding what Prof. Fernald seems to think about it. The genus *Sphinx* deserves careful study. It seems to me that the European *Sphinx ligustri* is a true *Sphinx*, and in this regard our species depart a little from the type and are numerous, while in Europe there is only one, the European *Convolvuli* being, in my opinion, referable to *Phlegethontius*. But this latter genus is decidedly South American in its character, and to

this category I would refer the remaining genera, *Diludia*, *Amphonyx* (a Florida colonist) and *Dilophonota*, while *Hyloicus* belongs to the first category. *Daremma*, with its three species, *Undulosa*, *Catalpæ* and *Hagenii*, may be rather strictly North American. Its nearest ally is the tropical *Syzygia Afflicta* (Cuba) and *Pamphilius* (Surinam). The rough, mixed gray, sometimes greenish, stout *Sphingidæ* belonging to the genera *Diludia*, *Syzygia* and *Daremma* (as also *Macrosila tetrico*) are South American and tropical in their general character. They approach *Phlegethontius* in structure and ornamentation, and the series culminates in the gigantic species belonging to Poey's very distinct genus, *Amphonyx*.

When we study the Canadian fauna we see that the South American forms tend to become rarer and drop out, whereas the forms of European affinity and strictly North American in character, persist. The condition of our present knowledge warrants the hope that we shall before long attain complete information as to the range of our Hawk Moths, and, by the aid of strict, unprejudiced studies of their structure, comparative with the South American and European forms, arrive at nearly exact conclusions as to the origin and progress of this most interesting family of Moths.

The conclusions, though entirely preliminary and tentative, which I have reached, as above, concerning our *Sphingidæ*, and which in detail I am willing to correct from further evidence, show us at least how deep-reaching the study of the origin of our fauna is, and what vast questions attend the subject of Geographical Distribution. It cannot be doubted that the study of our fauna, pursued in this way, gains in importance. The small links in the chain of eternal causation must be delicately handled and much must remain a matter of opinion, but always of *intelligent* opinion. Dogmatism is ridiculously out of place in all scientific studies, and nowhere is it more absurdly useless than in dealing with Butterflies and Moths, these frail structures which have hardly left an impression behind for all the æons they have flitted about this globe. Sipping the honey from the flower-cups, they have found their sudden grave most often in the stomach of some insectivorous vertebrate, and this may in one way account for the few fossils we find of them. But a variety of causes contribute to this result, and the imperfection of the geological or palaeontological record with regard to the Lepidoptera, entirely prevents our making tables of descent, such as have been prepared for so many of

the vertebrates by modern science. We are thrown for our surmises upon the structure of existing forms, and this very alluring study I have endeavored to give a sketch of in the present chapter. I repeat what I have often said, that only by such views of the Lepidoptera, such higher uses to which we may put our knowledge and observations, do we relieve the study from the charge of triviality, a mere sorting and arranging of objects which is pursued by some even to the elimination of æsthetic amusement and pleasure, and degenerates into a mere storing up of specimens rare and difficult to obtain, and panders to the strictly selfish passions of the human heart.

(To be Continued.)

NOTE ON AGROTIS HOSPITALIS.

BY A. R. GROTE.

Having recently, through the kindness of Mr. W. W. Hill, the well known Lepidopterist, been able to carefully compare my type of *hospitalis* with a series of *Agrotis perconflua* Gr., I believe we have to do with a variety of this latter species differing by the black marked t. a. line, the black edging on costal region of t. p. line, the more suffused and deeper color. The insects are structurally identical, and although variation in these points is not usual (I have not met with it), yet the perfect correspondences in other points carry the conviction that in *hospitalis* from Lewis Co., N. Y., we have only a form of *perconflua*. These more northern forms of the genus, viz., *Hilliana*, *conflua*, *perconflua*, and *rubifera*, are related to our common New York species, *A. Phyllophora*, and the Californian *A. Rosaria*, as well as to several European species of the genus *Agrotis*.

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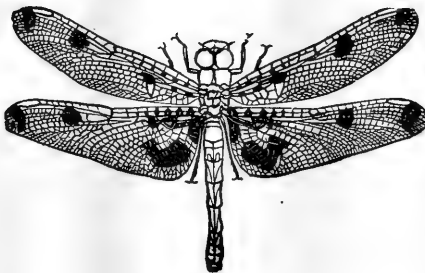
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No. 12

ON A NEW LIBRARY PEST.*

BY DR. H. A. HAGEN.

Everybody now-a-days has books, even if he never reads them. It has become an acknowledged fashion—the more books the larger the wisdom, the finer the culture. The climax is reached in France, where you can buy as decoration for fine rooms large libraries, where all the prominent classic authors are represented only by the handsomely lettered backs of the volumes, stored in cabinets with glass doors. The key of the cabinets is invariably mislaid; in fact, the cabinets do not open at all. But even where book-cases contain real volumes, it is interesting to observe which authors are never taken out. In German private libraries, the binding of Klopstock's masterpiece, the Messiah, is almost invariably as fresh as possible, and in England and here I have often seen Paradise Lost in a very fine condition. As an instance of the contrary, when I was a young man, an older prominent naturalist singled out a volume from my library in a condition best to be described by book and binding in tatters, and then exclaimed, "That is just how I like to see books." It was on bugs, and my scientific digestive organs were at that time in excellent condition. Later I was always interested in picking out books in similar condition in libraries, in order to have an idea of the taste and favorite studies of the patrons. I should state that the first prize could be given to a copy of Pepy's Memoirs, in the truest Billingsgate condition, greasy as candles. It was in a library intended for the culture of the young.

Let that be as it is; but certainly no owner of books likes to have his property destroyed except by himself. I had believed until recently that the most obnoxious enemies of books were my special friends, the insects. But I see now that I was decidedly wrong. A most interesting publication, "The Enemies of Books," by William Blades, in London, which

* Read before the Boston Thursday Club, January, 1886.

has gone through three editions during the past five years, shows conclusively that men are far greater enemies of books, at least in old England. Mr. Blades describes everything injuring books—fire, water, gas, heat, dust, neglect, and ignorance. Then come two short chapters on the book worm and other vermin, followed by chapters on bookbinders and collectors. The small volume contains facts which will be read with virtuous astonishment and disgust. A rich shoemaker, John Bagford, one of the founders of the Antiquarian Society, in the beginning of the last century, went from library to library, tearing away title pages from rare books of all sizes. These he sorted out according to nationalities and towns, and so formed over a hundred folio volumes now preserved in the British Museum. Others collect initials on vellum, all rich in gold and colors, floral decorations ranging from the 12th to the 15th century, all nicely mounted on stout cardboard. A Mr. Proeme collects only title pages, to follow a senseless kind of classification. One of his volumes contains coarse or quaint titles, showing how idiotic or conceited some authors have been: "Bowels Opened in Diverse Sermons," "Die and be Damned," and many others too coarse to be quoted. Certainly it is sure that the poor bugs cannot compete with such rivals, except some more enterprising ones, apparently bound west, and going straight through 80 folios of patristic works, making them look like a spy-glass, in a fashion never dreamed of by Chrysostomus and his partners.

Nearly six years ago I was invited to make a communication about library pests, at the meeting of the librarians in Boston. After a review of the literature then at my command, I came to the conclusion that only two insects were to be considered very dangerous and obnoxious in North America, the Anobium and the White Ants. The Anobium is a small beetle, which is also very destructive to old furniture and old picture-frames. All who have the infirmity to indulge in the love for old furniture, will have often observed with disgust small round openings in their treasures, out of which a fine mealy dust falls in little heaps on the floor. I observed myself such a case long ago, when I was a boy, but I confess that the remembrance of this case is always accompanied by a strong itching of my right ear. A lady cousin of mine who was a lover and lucky owner of such old jewels, had decided to take care of them herself. I had been naughty enough to write the date in these dust heaps with my fingers. When I impudently ventured to show to her about a fortnight

later the date I had written still undisturbed, the only acknowledgment of my service came forth with admirable dexterity.

Use every man after his desert, and who should 'scape whipping?

Nevertheless I gave up forever this kind of chronological record.

Three additions to my communication before the librarians have been published, but they contain only isolated cases, certainly nothing of general importance. Of course the insects mentioned had injured books, and as everybody likes to have his own little pest, the new comers were chronicled with some emphasis. Nevertheless I have followed up the matter carefully during these six years, and would be able to give a nice list of names of more or less queer composition. Six years ago a part of the publications on book pests was not to be found here. But in the meantime I have been able to get some of them, the most important ones through the splendid custom of the public library of ordering books wanted by scientists for their study.

There is, in fact, no end of obnoxious creatures. "Misery acquaints a man with strange bedfellows." Perhaps the word obnoxious is not exactly in the right place, as probably those bedfellows may consider the intruding stranger decidedly obnoxious. Nevertheless, as such philosophical views would destroy every legitimate Museum's business, we are bound to our accustomed impoliteness towards all intruders.

One morning Mr. R. T. Jackson, assistant in Geology in the Museum, asked my advice and help against a new pest in his department. The stones and petrefacts were left untouched, but all the new labels, written during the past year, were more or less injured, or nearly destroyed. Of course this is a serious danger for a collection, as the specimens lose their value if the locality or the scientific name is lost. A new form of labels had been chosen last year printed on excellent card paper. The stones are kept in small square open boxes, the label is folded in the middle; upon the lower half the stone is laid, to keep the label in place; upon the upturned half the locality and the name are written in order to afford an easy view of the contents of the collection. Now, since last winter this upper half has appeared to be scraped on both sides in such a manner that the writing is injured and in some cases has disappeared. The lower half of the label was similarly injured, so far as not covered by the stone; the under side of the lower half proved never to be injured, and was apparently protected by the bottom of the box, to which it was pressed

by the weight of the stone. The damage is a considerable one, as the whole collection is again to be provided with new labels. A careful research led to the discovery of an insect belonging to the genus *Lepisma*, which lived in the boxes and cabinets. The old labels of common writing paper were never attacked, therefore it was to be presumed that the finish of the new labels was the attraction to the insects. Indeed, Professor C. L. Jackson found the new labels finished on both sides with starch, and without doubt the starch covering attracted the *Lepisma*. I was rather puzzled by this fact. It has been known for more than a century that the greatest library pest, *Anobium*, does not like starch. Therefore it was recommended to use in binding books only such paste as was made of pure starch without meal, of course also with the addition of several drugs of the most vicious odor; and now a new customer proves to prefer starch to other things. It is, by the way, a queer but very common association of ideas that substances with an unpleasant scent to man should also be unpleasant to insects. But the virtuous hater of Rockfort or Limbourg cheese would directly be disabused by discovering with a common hand lens a lively carnival of bugs in those disgusting dainties.

The *Lepisma* destructive to the labels is a true American insect, described by Professor Packard as *L. domestica*. It belongs to a small group of insects with the euphonious name *Thysanoura*, and there are half a dozen species known in the United States. The principal one found in Europe is the *L. saccharina*, better known as the Small Blue Silver-fish. This little insect is found in dark places or corners near provisions, running very fast, and being so soft that it is crushed by the lightest touch. In Europe it has always been considered, but without proof, as imported from America. It has been known there for more than 200 years, but its existence cannot be traced before the discovery of America. The whole body of the insect is covered with very fine iridescent scales, which have been used as a delicate test object for microscopes, and are the cause of its vulgar name, Silver-fish.

The earliest notice of the small European species is in R. Hooke's *Micrographia*, a folio, London, 1665. It was printed at the expense of the Royal Society, and is an account of innumerable things examined by the microscope. The book is still respected for the accuracy of the author's observations. Mr. Blades calls it most amazing for its equally frequent blunders. I have reason to suppose that the absurd blundering

is more on Mr. Blades' side. R. Hooke calls it Book-worm, and states that it corrodes and eats holes through the leaves and covers of books. The figure is for the time tolerably good and recognizable. On Mr. Hooke's authority, *Lepisma* was reported as obnoxious to books. As Mr. Hooke has apparently mixed up the destructions done by *Anobium* with those of *Lepisma*, of which in the following hundred years no damages were observed, the whole observation was doubted, and Prof. Herman, in Strasbourg, in his prize essay on library pests, declared (1774) that *Lepisma* was erroneously recorded as obnoxious. This was the reason that I did not mention *Lepisma* in my communication to the librarians, the more so as in the past hundred years no new observations had again been recorded. I did not mention other remarkable facts, as the Jehthio-Bibliophage, a codfish which had swallowed three Puritanical treatises of John Frith, the Protestant martyr. No wonder, after such a meal, the fish was soon caught and became famous in the annals of literature. This is the title of a little book issued upon the occasion: "Vox Piscis, or the Book-fish, containing three treatises which were found in the belly of a Codfish in Cambridge Market, one midsummer eve, 1626;" great was the consternation at Cambridge upon the publication of this work.

Nevertheless, just after the delivery of my communication, new proofs of the depravity of *Lepisma* came forward.

"God made him, and therefore let him pass for a man."

Prof. Westwood, of Oxford, showed to the Naturalists' Association in 1879, a framed and glazed print of which the plain paper was eaten by *Lepisma*, while the parts covered by the printing ink were untouched. I accept this as a sufficient proof of obnoxiousness, the more so as the white paper is often the best part of a print. Prof. Westwood mentioned that the same fact had been observed in India, where some of the Government records had been injured in the same manner.

Patrick Brown states in his Natural History of Jamaica, that *Lepisma saccharina* is very common there, and extremely destructive to books and all manner of woollen clothing. This notice had been reproduced by Linnæus, but was later considered as not reliable.

Mr. De Rossi writes in 1882 as follows: *Lepisma saccharina* likes damp places and destroys in my house paper hangings from inwards entirely. Muslin curtains were perforated and the living animals found near fresh holes. Probably the curtains were starched, though it is not

stated. Also, insect boxes and the wings of butterflies have been damaged.

Prof. Liversidge, in Sidney, reports the same year *L. saccharina* as very common in New South Wales. It does not do so much harm to books, as it cannot well get in between the closely pressed leaves of a book, but it injures loose papers, maps and labels; the loose edges of piles or bundles of letters suffer more than the central portion. Writing paper, too, probably contains more attractive matter in the way of size. The labels were written only 15 months ago, and some hundreds have been rendered totally worthless.

The same calamity is reported by Mr. H. Lucas, assistant in the Museum of the Jardin des Plantes, in Paris. *L. saccharina* destroys labels of white paper, but the parts printed with oil and minium remain untouched. The labels on starched paper were very much injured, but only the white parts. When leaving for the country in 1862, he put in a drawer various articles of clothing, all starched, collars, cuffs and bonnets, and returning after six weeks, he found numerous holes, round or oval, in a bonnet, and *Lepisma* near by. On the labels of Polyps, Madreporas and others in the Museum, the writing was in a great part destroyed. Dr. Aube, in Paris, says that the black part of the backs of bound books was nearly destroyed, probably by *Lepisma*.

Mr. Samuel Henshaw, Assistant of the Society of Nat. Hist. in Boston, enclosed purposely living *Lepisma* with soft paper, part of a newspaper, in a glass jar, and ascertained that the insects had eaten large holes in the paper.

The well-known antiquary, Mr. Quaritch, in London, had complained, 1870, of the ravages done to books; and Mr. Lewis, in London, after careful examination, stated that by eating parts of the bindings the books were caused to fall to pieces; yet he considered it impossible for *Lepisma* to bore holes in the books, which were probably made by *Anobium*. Prof. Packard, in his Guide, reports of silk and silken tapestry eaten by *Lepisma*, which also devour the paste, making holes in the leaves of books. Also, Mr. Horne, in London, alluded to the damages done to silk garments in India by *Lepisma*. The insect evidently attacks the silk on account of the stiffening matter in it, but nevertheless makes holes in the fabric. Finally, Mr. Adkin showed a species of *Lepisma* which damaged account books kept in the iron safe of an office in London.

After all these reliable facts, there is of course no doubt that *Lepisma*,

when left undisturbed, may become very obnoxious. The question, Why has that not been observed long ago? may be answered by the well known "I awoke one morning and found myself famous!" I think there is a very simple explanation. There are so many rogues who work in the same way, that the swiftest one to disappear is often easily overlooked. Many times I have been told by ladies that their silk dresses, always black ones, had been destroyed by carpet bugs, and have always answered that the carpet bugs only attack wool. Indeed, I confess that I have only recently learned that these aristocratic desires belong to the Silver-fish.

If we tabulate all the facts, we find directly that all damages, except those to paper and its combinations, have been inflicted on silks, clothing and muslin curtains which were invariably starched or finished with some stiffening size, making them more easily eaten or eroded. Secondly, the backs of books have been more or less seriously injured. But just here paste had been used in quantity. The gold lettering of the backs is commonly done by putting the gold on paste and burning the hot brass letters into the back. I have been assured that in one case only the gold of the lettering had disappeared. There is no wonder that silken and paper tapestry has been eaten; but it is to be hoped that the industry now common of making paper hangings solely of arsenic may induce *Lepisma* to emigrate to more hospitable quarters.

That labels in collections have been destroyed, is observed here, in France and in N. S. Wales. All those labels were starched. Prints have been destroyed in England; letters, when lying loose or in heaps, and government records in England, in N. South Wales and in Boston. I think many gentlemen present will find the most rascally instance of destruction is the making erasures in account books in the safe.

After all these facts, there is no doubt that maps, engravings, collections of photographs, herbariums, even label catalogues, are in evident danger. But if we look more closely at the injuries reported, we find directly that all such papers, when pressed firmly together, were not reached by *Lepisma*, and in this way a large number of accidents may be avoided. Engravings and maps, which would suffer if pressed too hard, will be perfectly safe in simple pasteboard boxes, provided that they are made to close perfectly, so that it is impossible for *Lepisma* to find an entrance. Insect powder sprinkled in the nooks and corners where *Lepisma* is often observed—in Cambridge, behind the kitchen stove or

range—kills directly all reached by the powder, and I should recommend the same for silk dresses or the closets and drawers in which they are stored. Concerning valuable engravings, I would cover the backs of those framed with common paper fastened on with a paste mixed with insect powder or tincture. I consider, therefore, *Lepisma* as not dangerous *when proper care is taken to prevent the danger.*

The most dangerous enemies to papers and books are the white ants, the Termites, because they destroy everything and avoid the daylight, when they work. As I had before this the pleasure of delivering a communication on this subject, I will give only some additional facts which have come to my knowledge during late years. The common white ants of the United States are to be found everywhere, from Manitoba down to the Gulf of Mexico, and from the Atlantic to the Pacific. In the mountains in Colorado, Washington Terr. and Nevada, they ascend to 5000, and even above 7000 feet. It is of course not possible to exterminate them, but they must behave if they intend to live together with man. Their depredations should not exceed certain limits allowed to them. Everybody is accustomed not to forget for one moment the precautions necessary to protect his property against destruction by fire, and if the same precautions were taken and not for one moment forgotten, against the destruction by white ants, I think all that men are able to do would have been done. Of course, very valuable property we are accustomed to shield by fire-proof buildings, and similar caution will be necessary to protect very valuable property, i. e., libraries, against white ants. Buildings should be stone or brick, and all stumps or roots of trees taken out of the bottom of the cellars to a depth of six feet before the cellar floor is carefully cemented. Outside the building should be surrounded by a deep open area; no flower beds, shrubs, ivy, as the necessary manure is the greatest attraction for white ants.

Large cities are certainly in less danger, at least some parts of them. I am sure that all that is called Back-bay in Boston, will be free from white ants, if they are not brought in by nice parks and similar fineries. The older parts of Boston are by no means free from the pest, but for palpable reasons the owners of infected property do not like to speak of such things. Their presence in the State House, in the so-called Dungeon, was noted in the papers four years ago. As nothing has been done to prevent the pest from entering other parts of the building, it is very pro-

bable that they have spread further. The note in the newspapers about the sudden break down of the wooden stand supporting the ensigns and standards, looks very suspicious. Perhaps white ants may know more about it. In the Dungeon only the taxation papers of the State were stored, and the white ants, when I saw it, had arrived at the twentieth year of this century. According to another notice in a newspaper (I cannot say if it is true), the archives of the Board of Health have been placed in the Dungeon—as the notice stated—for preservation. As the State House was built on a place that was formerly a beautiful garden, it is very possible that stumps not taken out may be the cause of the presence of the pest. To find out where the white ants came into the Dungeon, and to follow their gangs outside the building, would be the first and most important step to take. Indeed, two years ago a bill asking for a paltry sum for this purpose was brought before the Legislature, but laid upon the table. In a boarding house in France, infested by white ants, the floor of the dining room suddenly came down two flights, together with the table boarders. It is gratifying to learn that nobody was hurt, and as it is stated, they lost only their appetites for one day. So we may hope that if the Legislature should come down in a similar soft manner, they may lose only their appetites for one day, and that this *argumentum a posteriori* may be followed by an enlightenment about the pest. Indeed, the State House is not the only place infested by white ants in those parts of the city. A few months ago an old bachelor, in a house very near Mt. Vernon Street, had to take out all the injured lumber supporting the walls and to replace it by new. When told by one relation that it was rather dangerous, he answered that he felt very comfortable, as it was only every ten years he had to meet this expense. In the neighborhood of the State House, in small courts, are some sickly looking old trees, probably dear old pets of the owners. They have decidedly the appearance of knowing something about white ants. That may be as it is, but I believe that no library here is more in danger than that in the State House, and I am told that it contains very rare books, difficult or impossible to be replaced. The Athenæum, situated near the State House and on one side bordering on an old churchyard, seems at first in a rather dangerous situation. But the very substantial building, with high, and, I believe, vaulted basements, makes danger to the library appear very improbable. Nevertheless, it would be reasonable to always have the pest in mind, and to

often make a revision of those parts of the library which are little or rarely used. The Public Library does not seem in danger, but I know the surroundings only imperfectly. After all these gloomy predictions, I may assert that nobody would be happier than I if they were forever unfounded, and the librarian might say, What's Hecuba to him, or he to Hecuba!

ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN LEPIDOPTERA.

BY AUG. R. GROTE, A. M.

(Concluded.)

The following tables contain a partial resumé of the species common to Europe and North America, and also of what are technically known as representative species. I have intended to include only species which I have myself examined and which are with some certainty accurately compared. But the term "representative" species is in itself perfectly elastic, as I have elsewhere shown; in the present case the species compared are believed to have had a common ancestor in the Tertiary. With regard to the introduced species no historical data are accessible to me, and I doubt if any exist; it is a case for the operation of reasonable surmise. I think these tables are of preliminary interest and value; I first commenced to publish similar observations in the Bulletin of the Buffalo Society of Natural Sciences. In a comparison of European and American species we are chiefly indebted to M. Guenée and Dr. Speyer.

FIRST CATEGORY OF ORIGIN OF THE NORTH AMERICAN FAUNA.

I. Species of Moths Common to North America and Europe, probably not Introduced by Commerce, and thus Unchanged Descendants of a Tertiary Fauna.

Europe.

Euprepia caja (Linn.)
Agrotis C-nigrum (Linn.)
 pecta (Linn.)
 fennica (Tausch.)

N. America.

Grote, Check List, p. 15.
 Guenée, Noct. I., 328.
 Guenée, Noct. I., 326.
 Guenée, Noct. I., 270.

<i>Agrotis conflua</i> Treits.	<i>Grote</i> , 6th Ann. Rep. Peab. Ac. Sci., 29.
saucia Hübn.	<i>Agrotis inermis</i> Harris.
ypsilon (Hufn.)	<i>Agrotis telifera</i> Harris.
<i>Eurois occulta</i> Hübn.	<i>Grote</i> , Can. Ent., vi., 13.
prasina (Fabr.)	<i>Guenée</i> , Noct., II., 5.
<i>Mamestra trifolii</i> (Rott.)	<i>Speyer</i> , St. Ent. Zeit., 137.
<i>Dipterygia pinastri</i> (Linn.)	<i>Grote</i> , Proc. Ent. Soc. Phil., I., 218.
<i>Euplexia lucipara</i> (Linn.)	<i>Guenée</i> , Noct. II., 65.
<i>Apamea nictitans</i> (Bkh.)	<i>Guenée</i> , Noct. I., 126.
<i>Heliophila pallens</i> (Linn.)	<i>Guenée</i> , Noct. I., 95.
<i>Pyrophila tragopogonis</i> (Linn.)	<i>Bethune</i> , Can. Ent., II., 73.
<i>Xanthia togata</i> (Esper.)	<i>Walker</i> , C. B. M. Noct., 461.
<i>Scoliopteryx libatrix</i> (Linn.)	<i>Walker</i> , C. B. M. Noct., 1011.
(?) <i>Heliothis armiger</i> Hubn.*	<i>Grote</i> , in Proc. Ent. S. Phil.
<i>Anarta melanopa</i> Thunb.	<i>Anarta nigrolunata</i> Pack.
myrtilli (Linn.)	acadiensis Beth.
cordigera (Thunb.)	luteola G. & R.
<i>Orgyia antiqua</i> (Linn.)	<i>Orgyia badia</i> Hy. Edw., Papilio, iii. 39.
<i>Prionia lacertinaria</i> (Linn.)	<i>Prionia bilineata</i> Pack.
<i>Ennomos alniaria</i> (Linn.)	<i>Ennomos magnaria</i> Guen.
<i>Metrocampa margaritata</i> (Linn.)	<i>Metrocampa perlata</i> Guen.
<i>Boarmia crepuscularia</i> (Treits.)	<i>Boarmia occiduaria</i> Guen.
<i>Asopia costalis</i> Fabr.	<i>Grote</i> , in U. S. Geol. Reports.
<i>Scoparia centuriella</i> W. V.	<i>Grote</i> , Check List, 52.
<i>Botis octomaculata</i> (L.)	<i>Botis glomerata</i> Walk.
<i>Nomophila noctuella</i> W. V.	<i>Grote</i> , Check List, 53.
<i>Salebria fusca</i> Haw.	<i>Grote</i> , in U. S. Geol. Survey.
<i>Pyrrhia umbra</i> Hufn.†	<i>Pyrrhia exprimens</i> Walk.

* Of this species I have described the large, pale greenish form, apparently not found in Europe, as *H. Umbrosus*; the dirty ochrey typical form is apparently common to both hemispheres. But the species of *Heliothis* may have been introduced by commerce, and I do not refer to them here any further on this account.

† This species (= *marginata* Fabr.) is the same apparently on both continents, but some authors erroneously regard *angulata* as a form of it. Now the varieties of a species seem always to follow the type form, and as *angulata* does not occur in Europe, it is not likely that it is a variety of *umbra*. I have figured both forms in the Buffalo Bulletin, while Dr. Speyer has been at some pains to point out the differences between

II. *Species of Moths Common to Europe and North America, probably Introduced by Commerce.*

Europe.	N. America.
<i>Trochilium apiforme</i> (L.)	Grote, Check List, 11.
<i>Sesia tipuliformis</i> (L.)	Harris, Ins. Inj. Veg., 234.
<i>asiliformis</i> (Rott.)	Grote, Check List, 12.
<i>Heliothis dipsaceus</i> (Linn.)*	<i>Heliothis phlogophagus</i> G. & R.
<i>var. maritima</i> Grasl.	<i>var. luteitinctus</i> Gr.
<i>scutosus</i> W. V.	<i>nuchalis</i> Gr.
<i>Plusia ni</i> Hubn.†	<i>Plusia brassicae</i> Riley.
<i>Asopia farinalis</i> (Linn.)	The Meal Moth.
<i>Galeria melonella</i> (Linn.)	The Bee Moth.
<i>Carpocapsa pomonella</i> (Linn.)	The Codling Moth.
<i>Tinea</i> and <i>Tineola</i> .	The Clothes and Carpet Moths (three species).
<i>Dakruma convolutella</i> Hubn.	<i>Dakruma grossulariae</i> Pack.

the two, although his material from America of *angulata* was incorrectly named for him "*exprimens*." Surely Dr. Speyer must be good authority that in Europe no variety of *umbra* corresponding to *angulata* exists! That another species of *Pyrrhia* exists in America is proved by *stilla*, which is perfectly and undoubtedly a distinct species from any of the others, and handsomer in colors.

* I incline to believe in the possibility that the species of *Heliothis* and *Pyrrhia umbra* have been imported by commerce; in this case the other two American species of *Pyrrhia* may be held as descended from a common ancestor in the Tertiary. This is at the best conjecture. But I am tolerably confident that our two species, *angulata* and *stilla*, are perfectly valid and distinct.

† This species is regarded as distinct and representative by some writers, but I cannot agree with them; the lateral abdominal tufts are the remarkable specific feature common to both forms; the larva feeds on cabbage, and I think it has been brought over like the Cabbage Butterfly. The *Heliothians* may have been brought with plants, but I do not feel confident of this with regard to *dipsaceus* and *armiger*; it is more likely, perhaps, with regard to *scutosus*, the larva of which feeds in Europe on *Artemisia campestris*. Probably specimens of the European *Zeuzera Aesculi* have occurred in New York, brought by the importation of trees or in wood, but the species has not spread. The Clear-wings above noted have probably been imported. There is a purposeful importation of European insects, with a view to acclimatization, going on, conducted by collectors acting from unscientific motives. Prof. Fernald has given us a very careful paper on *Tinea* and *Tineola*.

III. *Species which have very close Allies, and which have accordingly Undergone a Slight (Specific) Change since the Separation of the European and North American Faune in the Tertiary.**

Europe.

Hemaris fuciformis (L.)
 Deilephila galii (L.)
 Habrosyne derasa (L.)
 Triaena Psi (L.)
 Jocheaera alni (L.)
 Arsilonche albovenosa (G.)
 Agrotis baja (W. V.)
 augur (Fabr.)
 Copimamestra brassicae (Linn.)
 Dianthoecia cucubali (Bkh.)
 Hyppa rectilinea (Esp.)
 Helotrophia fibrosa (Hubn.)
 Oncocnemis campicola (Ev.)
 confusa (Ev.)
 Caradrina lepigone (Moeschl.)
 Pyrophila pyramidea (Linn.)
 Orthosia ferruginea (Esp.)
 Cosmia paleacea (Esp.)†
 Lithophane lambda (Esp.)
 ingrica G.†
 Lithomia solidaginis Hübner.†
 Calocampa vetusta (Hubn.)†
 Calpe thalictri (Bkh.)†
 Rivula sericealis (Scop.)
 Cidaria populata (Linn.)
 Triphosa dubitata (Linn.)
 Glaucopteryx caesiata (L.)

North America.

Hemaris diffinis Boisd.
 Deilephila chamænerii Harris.
 Habrosyne scripta Gosse.
 Triaena occidentalis G. & R.
 Jocheaera funeralis G. & R.
 Arsilonche Henrici Grote.
 Agrotis Normaniana Grote.
 haruspica Grote.
 Copimamestra occidenta Grote.
 Dianthoecia bella Grote.
 Hyppa xylinoides Guen.
 Helotrophia reniformis Grote.
 Oncocnemis pernotata Grote.
 Behrensii Grote.
 Caradrina miranda Grote.
 Pyrophila pyramidoides Guen.
 Orthosia ferrugineoides Guen.
 Cosmia infumata Grote.
 Lithophane Thaxteri Grote.
 pexata Grote.
 Lithomia germana Morr.
 Calocampa nupera Lintn.
 Calpe canadensis Beth.
 Rivula propinqualis Guen.
 Cidaria Packardata Lintn.
 Triphosa indubitata Grote.
 Glaucopteryx inventaria Grote.

*This category may be in so far almost indefinitely extended since I have shown that all grades of similarity exist, from undoubtedly different, but congeneric, to undoubtedly identical species. I have only included forms which run very close, about some of which perhaps naturalists are not clear whether they are the same or different. In the discussion of these it is to be regretted that much unscientific temper has been displayed, but that is the fault of that amateurism which Dr. Packard so deprecates.

† These are probably identical species.

SECOND CATEGORY OF ORIGIN OF THE NORTH AMERICAN FAUNA.

I. *Species which are probably Descended from North American Tertiary Ancestors, Occupying Comparatively the Same Territory.**

- Thyreus Abbotii Swainson.
Deidamia inscripta Harris.
Cressonia juglandis Abbot & Smith.
Dolba Hylaeus Drury.
Phemonoe quinquecaudata Ridings.
Alypia octomaculata Fabr., etc.
Hypoprepia fucosa Hübner.
Leucarctia acraea Drury.
Packardia fusca Packard, etc.
Lacosoma chiridota Grote.
Hyparpax aurora Abbot & Smith.
Heterocampa Astarte Doubleday, etc.
Platysamia cecropia (Linn.), etc.
Prionoxystus Robiniae Peck.
Leptina dormitans Guen., etc.
Eutotype Rolandi Grote.
Copipanolis cubilis Grote.
Harrisimemna trisignata Walk.
Arzama obliquata G. & R., etc.
Ufeus satyricus Grote, etc.
Marasmalus ventilator Grote, etc.

THIRD CATEGORY OF ORIGIN OF THE NORTH AMERICAN FAUNA.

I. *Species which have been long Domiciled and probably Originally of South American Origin.†*

- Philampelus Pandorus Hübner.
Citheronia regalis Fabr.
Eacles imperialis Drury.
Cosmosoma omphale Hübner.

* These are mere selections from a host of species which belong by descent to the North American fauna *per se*.

† This list is also extremely partial; at some time in the past there has probably commenced a movement from South to North which resulted in the settlement of the ancestors of these forms within the territory of North America.

Gnophaela vermiculata Grote.
Lycomorpha pholus Drury.
Ecpantheria Scribonia Stoll.
Empretia stimulea Clem.
Oiketicus Abbotii Grote.
Apatelodes torrefacta Abbot & Smith.
Hyperchiria Io Fabr.
Scolecocampa Liburna Geyer.
Remigia latipes Guen., etc.
Panopoda carneicosta Guen., etc.
Homoptera edusa Drury, etc.
Lagoa opercularis Abbot & Smith, etc.
Carama cretata Grote.
Anticarsia geminatalis Hübner.
Antiblemma canalis Grote.
Selenis monótropa Grote.
Homopyralis tactus Grote, etc.

II. *Species which are Partially Domiciled, not probably Continuously Breeding in the Middle States and to the Northward, where they are Winter-killed.*

Enyo lugubris Linn.
Aellopos Titan Cramer.
Dilophonota Ello Linn., etc.
Philampelus Linnei G. & R.
Anomis erosa Hubn., etc.
Aletia argillacea Hubn.
Euthisanotia timais Cramer.
Hyblaea puera Fabr.
 (?) *Hypocala Hillii Lintner.*
Erebus odora Linn.
Plusia egena Guen.

III. *Species which form part of the West Indian Colony in the Florida Peninsula.*

Spragueia pardalis Grote.
Cautethia Grotei Hy. Edwards.
Amphonyx Antaeus Drury.

Pachylia Ficus Linn.
Didasys Belæ Grote.
Lymire Edwardsii Grote.
Eupseudosoma floridum Grote.
Euhalisidota longa Grote.
Byssodes obrussata Grote.
Urapteryx floridata Grote.
Mecoceras Peninsularia Grote.
Almodes rivularia Grote.

These last eight species are presumed to be distinct from closely allied species inhabiting the West Indies. They have been colonized from thence and in part have undergone some local modification which is presumed to have progressed far enough to warrant a distinct title. It is in the same case with the first category; there will probably be found all grades of relationship in these Florida species, and we shall have to express as best we may the *amount* of these differences in our nomenclature. A sufficiently difficult task! And the "lumpers" will have to be fought against until all the life histories are known and have been quietly compared.

IV. Species which are probably mere Summer Birds of Passage from the West Indies and South America, following the Gulf Stream or Aided by Prevailing Winds.

Diludia Brontes Drury.
Argeus Labruscæ Linn.
Thysania zenobia Cramer.
Noctua agrippina Cramer.
Brotis vulneraria Hübner.
Sylectra Erycata Cramer.

These tables will rather show of what material our fauna is made up, what its relationships are, than any attempt to classify with precision a part of our genera and species according to their probable origin and distribution. But very little has been yet published, so that full lists cannot be compiled; the foregoing are mainly drawn up from my own experience and work.

I believe that these conclusions as to the origin of our genera may be properly criticized from a better knowledge of the facts, but I also believe

that these general ideas as to the origin of our fauna will more and more come to be regarded as probably true, and that I have given them a proper scientific basis.

As we go southward, the Canadian fauna gradually absorbs southern elements in its character. Certain genera, which are plentifully represented in the West Indies, appear in single species; as, for instance, the brightly colored, clear spotted, arctic form, *Zygaenidæ*. Occasionally, at least, *Cosmosoma omphale* occurs in New Jersey; it is not rare in South Carolina; I have taken it, flying in the daytime, in Alabama. Again the larger species of *Ceratocampinæ*, such as *Citheronia* and *Sphingicampa*, become more plentiful in individuals in the Middle and Southern States. There is a change in the character of the *Noctuidæ*; certain genera of the *Nonfasciata*, such as *Orthosia* and allies, *Lithophane*, etc., gradually disappear, and the genera of the *Fasciata*, such as *Homoptera*, *Pleonectyp-tera*, *Poaphila*, *Remigia*, *Homopyralis*, etc., become more plentiful. Again, as we go westward, the Heliothians appear in more numerous forms of genera and species, and, in Colorado and California, are quite important components of the *Noctuidæ*. But, as a whole, we have a fauna of moths homogenous in general character until, on the Atlantic side, we strike the tropical colony in Florida, and, on the west, we meet the Mexican fauna in Texas and the South-west Territories. Labradorian and Arctic forms we meet again on the summits of the White Mountains in the east, and on the Rocky Mountains and parallel ranges in the west. The local lists which have appeared of late, and the compilation of which is most laudable work for entomologists in all parts of the country, bear out this general view. The replacement and change of species is a very gradual one; striking differences will be called out by the comparison of localities separated by mountain ranges. If the student will bear in mind the different elements which go to make up our fauna, and which are here superficially discussed and indicated, he will arrive at some comprehension of the relationship which our fauna bears to that of Europe, Northern Asia and South America, and, in time, its true distinguishing features can be fully grasped. My own principal satisfaction, during late years, has arisen from a slightly increased apprehension of the importance of the problems of geographical distribution, and how they may have been influenced and brought about. All this will come clearly to light when large collections shall have been brought together from all principal points

within our territory, while the study of the West Indian, Mexican and South American faunæ is one to which the North American student of our moths must sooner or later betake himself, if for no better reason than that it is necessary for a better knowledge of his own particular fauna, which stands in close relationship to these and takes no note of political boundaries. Already I hear of one good student, Mr. Wm. Schaus, working away in Mexico!

Very instructive tables may be prepared of the different expression of European and American genera of moths. We have, for instance, more than double the number of species found in Europe of the genera *Apatela*, *Oncocnemis*, *Catocala*, etc. In fact, going parallel with our larger territory, all the principal genera of Moths represented on either side of the Atlantic contain a larger number of American than of European forms; and this with but few exceptions, such as *Eupethecia*, where the American species are probably but indifferently known. Certain genera, very largely represented in Europe in the Moths just as in the Butterflies, are totally wanting in America, as, for instance, *Zygaena*. I am speaking now of peculiar genera which give a determinative expression to the faunæ, leaving out of sight the innumerable cases of nearly allied genera replacing each other on the two hemispheres. The time for the institution of such comparisons will not fully come until our Western faunæ are well known. So important an European genus as *Hypopta* has only been recently discovered in Arizona, and undoubtedly we have yet much to learn before we really know what forms our territory harbors. Quite unexpectedly Prof. Snow found in New Mexico a species, *Halisidota trigona* Grote, which has an exceedingly close ally in South America, figured by Dr. Herrich-Schaeffer. But what was to me a most surprising fact was the discovery, by Mr. W. W. Hill, of Albany, N. Y., of *Hepialus auratus* Grote in the North Woods. This species belongs to the genus or subgenus *Plusiodes* of Herrich-Schaeffer, and our species has a near ally in Brazil as illustrated by this authority. That such a genus as *Hepialus* should be so widely distributed, considering its life history, structure and habits, is a proof of the great age of this type of the Moths. Other Bombycidæ might easily spread themselves, but the Ghost Moths would seem by their weak structure, somewhat unwieldy flight and nocturnal habit, not to be of this number. *H. auratus* has patches of dead gold scales principally about the cell of primaries at base, while three bright, gilded, tri-

angular, superposed, brown-edged spots form part of the subterminal band opposite the cell. The hind wings are pinkish fuscous ; both wings have the short fringes shaded with orange. Almost all the *Hepialinae* are thinly scaled, sub-transparent, and the peculiar fact that the secondaries are also 12-veined render them anomalous among Moths. I notice that the Rev. Mr. Cramer records the fact that he captured some twenty specimens of the "Graceful Ghost," *Hepialus gracilis* Grote (the tautology of the English name is better than its equivalence), sitting against the trunks of trees in a cemetery (appropriate spot !) at St. Johns, New Brunswick. I wonder he did not run away from them, with their ill-omened name, conferred, I believe, from the ghostly appearance of the European *Hepialus Humuli* when flying, the male of this species being silvery white above and brownish gray beneath, and, in its vacillating flight, exposing now the white and then the dark surface, presents an uncanny appearance in the dusk of evening. A large species, *Hepialus argenteomaculatus* of Dr. Harris, inhabits the Catskill Mountains, as also various localities in the Eastern States. Dr. Harris originally in his Report describes this species, which has dusky fuscous bands and is of a dull obscure tint, as compared with a second larger silver-spotted species, having a salmon pink tinge and figured by me in the Proceedings of the Philadelphia Entomological Society many years since under the name of *Hepialus quadriguttatus*. The silvery spots are smaller as compared with Dr. Harris' species ; but, strange to say, in Agassiz' "Lake Superior," now a rare book, Harris figures my larger species, which inhabits the Lake Superior Region and Canada, as identical with his *argenteomaculatus*. I have also a suspicion that my *quadriguttatus* has been re-named by Mr. Strecker, but I am not certain of this synonym as I am of so many others which might have been avoided by only a little more care as to what has been published. If students would only study our own periodical literature covering the last twenty years or so before putting pen to paper ! I know of so many instances where this obvious duty has been neglected. And then if they would always have surely the right name of the species they discuss. I have known a great deal of argument wasted on a wrong determination.

In concluding this somewhat discursive, but I hope not on this account less readable paper, I cannot but pay my tribute to the CANADIAN ENTOMOLOGIST and its contributors for important contributions to the development of our knowledge. Speaking with the experience of more than a

quarter of a century of active scientific work behind me, I may be excused if I acknowledge how much I myself, at any rate, have profited by this regularly appearing publication, which, alone by its constancy, gives one courage to persist. A host of facts have been painstakingly recorded in its pages, year by year, and an article on our Insects written without a knowledge of what the CANADIAN ENTOMOLOGIST contains, would be a comparatively valueless contribution. The Canadian Entomologists themselves are a body of careful, if conservative, workers, filled with the proper spirit of devotion to their pursuit, and, above all, courteous and kind as correspondents. I am myself so much indebted to their many favors that what little I have been able to accomplish takes much of its value from their assistance; while the impartial editorship of their journal has led me to entrust my manuscripts freely for publication, thankful for the opportunity of recording my modest discoveries upon its friendly page.

PRESENTATION.

It affords us much pleasure to announce that our esteemed friend and valued contributor, Mr. AUG. R. GROTE—now residing at Bremen in Germany—has been presented by His Highness the Duke of Saxe Coburg-Gotha (brother-in-law of Her Majesty the Queen), with the large Silver Medal, *Princeps Musarum Sacerdos*, for Art and Science. The award was accompanied by a very friendly letter, alluding in warm terms to Mr. Grote's literary and scientific talents, and was entirely unexpected by its recipient. We beg to offer Mr. Grote our hearty congratulations on this pleasing recognition of his work and attainments.

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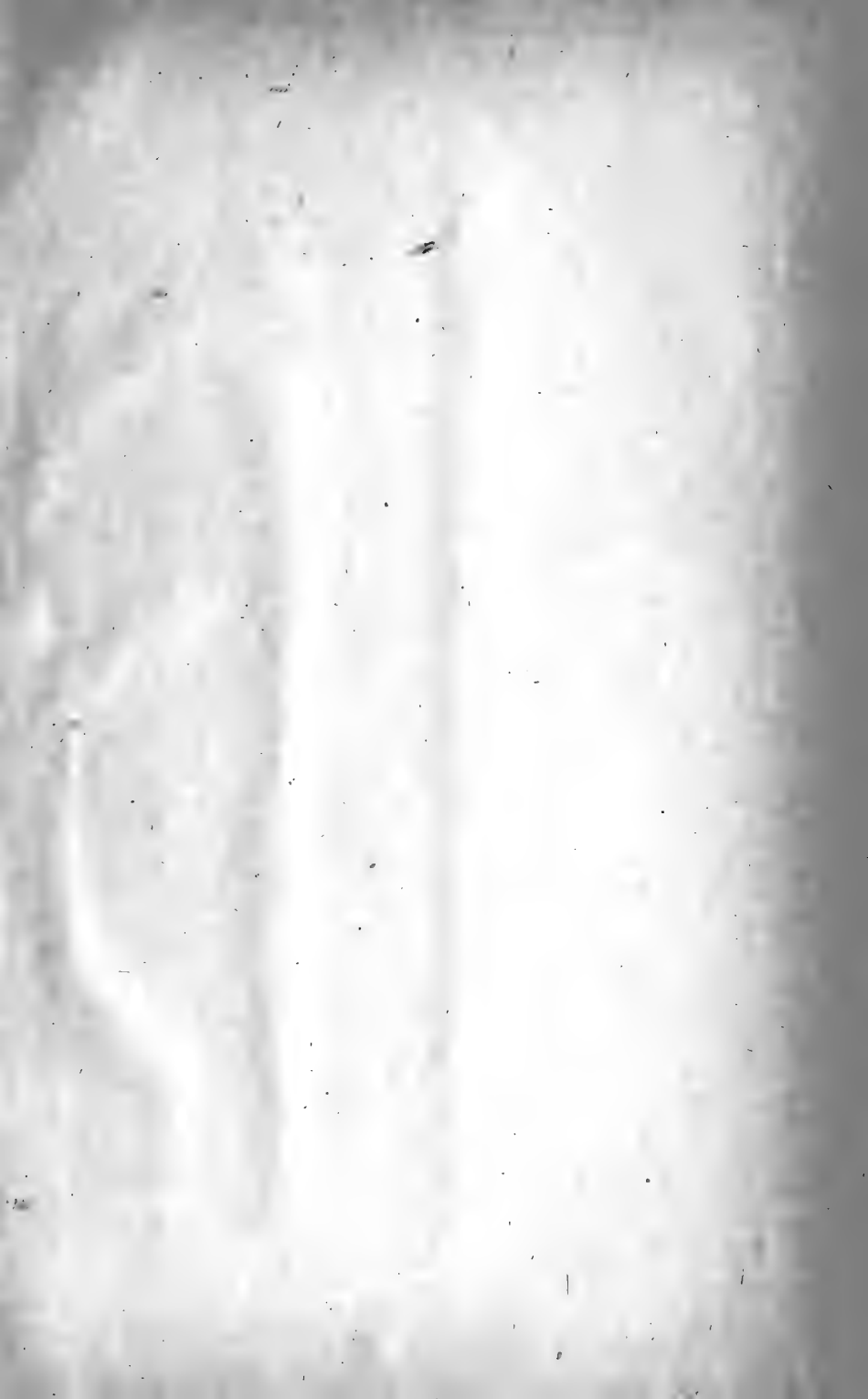
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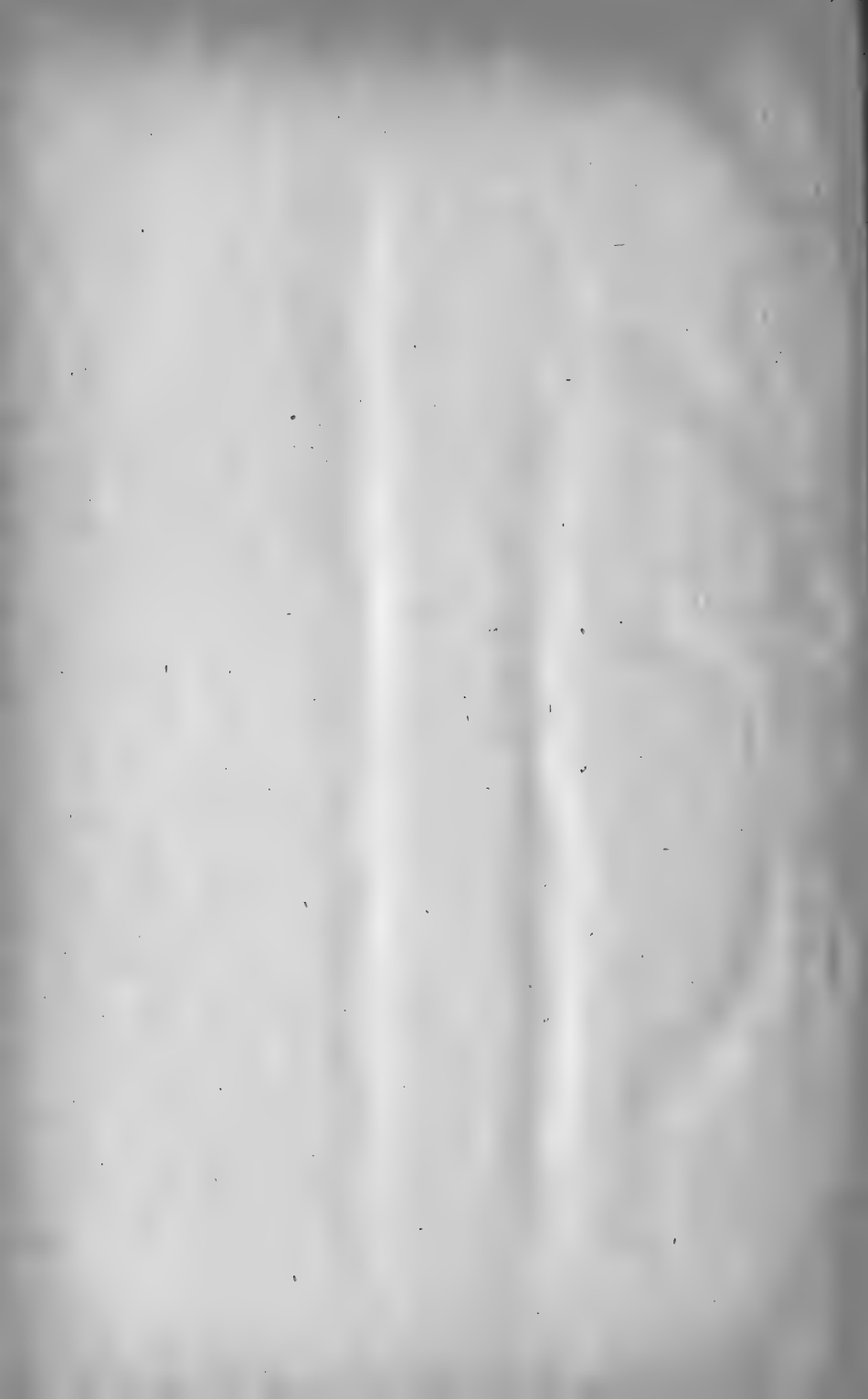
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